INSTRUCTION MANUAL

MICRO 4000® NET Web Guide Control System

Software Versions:

M4K 23.xx

DLG 21.xx

RMT03 GP21.xx

RMT03 AR21.xx

Document P/N 990040-230 (Rev. 2)

Guiding
PERFORMANCE

Leading
TECHNOLOGY

AccuWeb,® Inc.

P.O. Box 7816 • Madison, Wisconsin 53707
Ph: 608/223-0625 or 1-888-422-2893 • Fax: 608/223-0074 • E-mail: frontdesk@accuweb.com

Table of Contents

MICRO 4000® NET Web Guide Control System 3

Introduction *4*

Installation *7*

Operation *10*

Troubleshooting *11*

Appendix 1 / Motor Drive Calibration *15*

MICRO 4000® NET Controller 16

Introduction *17*

Parameters *17*

Appendix 1 / Parameter Summary *39*

Appendix 2 / Error Codes *42*

Appendix 3 / Oscillation Function (Optional) *43*

Appendix 4 / Inhibit Input *45*

Appendix 5 / Discrete Isolated Inputs *46*

Appendix 6 / Discrete Isolated Outputs *48*

Appendix 7 / Analog Inputs and Outputs *50*

PointSource™, WideArray™, and Hi-Temp Edge Detectors 56

Introduction *57*

Setup *58*

Calibration *59*

Maintenance *60*

AccuBeam® 3 Digital Line Guide Sensor 61

Introduction *62*

Installation *63*

Operation *64*

Calibration *66*

Parameters *72*

Keypad Lock *79*

Troubleshooting *80*

Maintenance *81*

Appendix 1 / Parameter Summary *82*

Appendix 2 / Line Guide Test Pattern *83*

AccuWeb® Linear Actuators 84

Introduction *85*

Setup *85*

Maintenance *86*
Remote Station - Guide Point Adjust 89
Introduction *90*
Installation *90*
Operation *91*
Parameters *92*
Keypad Lock *96*
Troubleshooting *97*
Remote Station - Auxiliary 98
Introduction *99*
Installation *99*
Operation *100*
Keypad Lock *101*
Troubleshooting *102*
Fieldbus Interface 103
Introduction *104*
Installation *104*
Programming Information *105*
Troubleshooting *118*
Appendix 1 / DeviceNet Interface *119*
Appendix 2 / Profibus Interface *122*
Appendix 3 / ControlNet Interface *125*
Appendix 4 / Modbus Plus Interface *128*
Appendix 5 / Ethernet TCP/IP and Modbus/TCP Interface *132*
Service / Return Authorization 136
Restocking Policy 137
Warranty Policy 138
Installation Drawings 139

Important! Make sure the first two digits of the software version numbers shown on the cover of this manual match the first two digits of the version numbers displayed by your controller, digital line guide or remote station. If they do not match contact AccuWeb to obtain the correct manual.

AccuBeam®, AccuWeb®, MICRO 1000®, and MICRO 4000® are registered trademarks of AccuWeb, Inc.

PointSource™ and WideArray™ are trademarks of AccuWeb, Inc.

MICRO 4000® NET Web Guide Control System

Introduction

The MICRO 4000 NET Web Guide Control System is a microprocessor-based control system for medium to large-sized web guides. It is compatible with AccuWeb's dynamically compensated ultrasonic and infrared edge detectors, digital line guide, remote stations, and all linear actuators.

A MICRO 4000 NET system can include up to seven main components:

1. Edge Detector or Line Guide Sensor

PointSource and WideArray Compensated Edge Detectors

- Ultra-compact housing
- Available with sensing areas ranging from 0.2" to 18.6" wide [5mm to 472mm]
- Available with gap widths ranging from 1.5" to 4" [38mm to 102mm]
- Fully compensated for temperature, humidity, dust, and most other process contaminants
- Immune to passline variation and web flutter
- Suitable for long cable length applications
- Intrinsically-safe models available for hazardous environments
- Ultrasonic models are ideal for transparent or opaque film, paper, and foil web materials
- Infrared (IR) models are ideal for non-wovens and other porous web materials

Hi-Temp Compensated Ultrasonic Edge Detector

- Withstands oven temperatures up to 500 deg F [260 deg C]
- Available with waveguide tube lengths up to 84" [213cm]
- Fully compensated for temperature, humidity, dust, and most other process contaminants
- Immune to passline variation and web flutter
- Suitable for long cable length applications
- Intrinsically-safe models available for hazardous environments
- Ideal for transparent or opaque film, paper, and foil web materials

AccuBeam 3 Digital Line Guide Sensor

- Ultra-compact housing
- Three light source colors and three illumination angles provide optimal lighting
- Line and edge guiding modes
- Pattern matching algorithm locks onto hard-to-see lines
- Auto-calibration automatically selects optimum settings
- Environmentally-sealed function switches and display
- Suitable for long cable length applications

2. MICRO 4000 NET Controller Board

- Single-board design
- Auto-recovery after power interruption
- Non-volatile memory for user-settable parameters and operating modes
- On-board parameter entry keypad and display
- Two edge detector inputs for centerline guiding
- Serial I/O port for remote station and digital line guide
- Analog ±10 VDC output for controlling motor drive
- Actuator end-of-travel inputs:

  Potentiometer input for electronically-adjustable limits

  Limit switch inputs for fixed limits
- Opto-isolated inhibit input
- Opto-isolated fault indicator output
- Auxiliary analog and digital I/O
- Input voltage: 90-132 VAC or 180-264 VAC, 50/60 Hz, single-phase

3. MICRO 4000 NET PWM Motor Drive

- Fast, accurate response to web movement
- Drives brush or brushless DC motors up to 746 watts (1.0 HP)

4. MICRO 4000 NET Enclosure

- Low profile
- Environmentally-sealed function switches
- Cam-locked door with double-bit insert key
- External mounting feet

5. AccuWeb Linear Actuator

- Available with brush or brushless DC motors up to 746 watts (1.0 HP).
- Available with standard stroke lengths up to ± 6” [± 152mm] (other lengths available upon request)
- Available with limit switches or potentiometer for sensing end-of-travel limits and servo-center position

6. Fieldbus Interface (optional)

- Links the MICRO 4000 NET system with a remote PLC or computer through a fieldbus network
- Compatible with most fieldbus protocols, including DeviceNet, Profibus, ControlNet, Modbus Plus, Modbus/TCP, and Ethernet TCP/IP
- Provides control of operating mode, guide point position, and other functions
- Permits monitoring of actuator position, web position, and other status indicators

7. Remote Station (optional)

- Rugged, ultra-compact housing
- Remote guide point adjustment or remote access to digital line guide's front panel
- Environmentally-sealed function switches and display

Product Specifications:

- Enclosure size (H x W x D): 9.84" [250mm] x 11.81" [300mm] x 5.91" [150mm]
- Power requirements: 90-132 VAC or 180-264 VAC, 50/60 Hz, single-phase
- Operating environment:

Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing

Installation

The MICRO 4000 NET system has been tested, calibrated, and run at the factory in a closed-loop configuration. After installation, most systems may be started up and operated without further adjustment. Refer to the connection and wiring diagrams on page 139 for cable installation information.

OEMs: If shipping clamps and spreaders are removed, make sure that they are re-installed prior to forwarding to the final destination. Verify that all mechanical and electronic components are secured for shipment.

1. Linear Actuator and Guide

Install the web guide and linear actuator into the machine. Refer to the guide and actuator application drawings on page 139 for installation information. Once the web guide is installed, it must be trammed to the rest of the machine.

Note: Make sure the actuator is in the servo-center position before tramming the web guide. This may not be possible until after step 5, below.

Important: Special attention must be given to the actuator mounting. Any mechanical compliance or backlash in the actuator mounting will seriously affect guiding accuracy. Deflections of a few thousandths of an inch will reduce the performance of the system. Also, an anti-rotation bracket is required for most applications. The actuator must be allowed to gimbal slightly on the ball rod ends to accommodate minor actuator mounting misalignment.

Note: Motor contains no temperature-sensing device to protect motor from excessive temperature due to failure-to-start or overload. Motor should be protected by other means in accordance with the NEC and local code requirements.

2. Sensor (Edge Detector or Digital Line Guide)

Install the sensor (edge detector or digital line guide). Refer to the guide and sensor application drawings on page 139 for installation information. Use of the AccuWeb edge detector mounting bracket simplifies installation and adjustment.

The sensor cable should be long enough so that the sensor may be repositioned if the web width or web path changes. The standard cable length is 12 feet. Longer cables are available upon request.

Note: The cables supplied with the system have been chosen for specific shielding and capacitance properties. DO NOT splice or replace these cables with any other style or configuration of cable. This can cause serious degradation or complete loss of system performance. DO NOT SPLICE CABLES. Longer cables are available upon request.

3. Control Enclosure

Install the control enclosure on a rigid mount such as a wall or secure framework. Do not install the control enclosure on the side of a dryer or in other high temperature areas. Also, do not install the control enclosure on a moving winder structure.

4. Electrical Power

Note: Electrical power must be provided from a customer-supplied disconnect. Connections must comply with NEC 590 and other local codes.

a) Verify that the power source is *off* and locked out.

b) Install the electrical power cord through the right-most cord grip.

c) Connect the cable to the terminal block located inside the enclosure.

d) Make sure the circuit board is free of metallic debris such as screws, lockwashers, and wire strands.

e) If any of the cables have been removed, shortened, or modified in any way, make sure the connections agree with the appropriate connection and wiring diagrams located on page 139.

5. Static Test

a) Apply power to the system.

b) Press the MANUAL button.

c) Press the IN and OUT buttons several times. The actuator and web guide mechanism should move freely and without hesitation.

d) Press and hold the IN button. When the guide mechanism gets near the In limit, release the button.

e) Jog the IN button repeatedly until the actuator automatically stops at its end-of-travel limit.

Caution: If the actuator or web guide mechanism hits a mechanical obstruction before the actuator stops automatically at its end-of-travel limit, release the button immediately. Continued activation will cause serious damage to the actuator motor and/or guide mechanism.

f) Repeat the previous two steps using the OUT button in order to check the Out limit.

g) Press the SERVO-CENTER button and verify that the actuator drives to the center of its stroke.

6. Dynamic Test

a) Press the SERVO-CENTER button and verify that the actuator drives to the center of its stroke. This also places the web guide in its center (or *tram*) position.

b) Thread the web through the machine and put a slight tension on it so that the web is in its normal operating position.

Repeat steps c) through h) for each sensor:

c) Press the SERVO-CENTER button.

d) Position the sensor.

Edge detector: Place at the edge of the web. The edge detector's null indicator LED will turn off when the edge detector is positioned correctly. The scribed lines on the edge detector indicate the approximate location of the detector's guide point.

Note: The default calibration supplied with the system should work for most materials. However, if the null indicator LED does not turn off, then the detector may need to be calibrated. Refer to page 59 for calibration instructions.

Digital line guide: Position the sensor so that it is approximately centered over the registration line or edge. Calibrate the sensor (refer to page 66 for calibration instructions). When the sensor is calibrated and positioned correctly an indicator dot will appear in the display under the line or edge you want to track.Press the EDGE A, EDGE B, or LINE button to select the sensor under test.

e) Press the AUTOMATIC button.

f) Slowly move the sensor left or right and observe how the guide reacts. The guide should move the web so that it follows (or chases) the movement of the sensor.

Edge detector: The guide should move the web so that the edge of the web is always aligned with the edge detector's guide point.

Digital line guide: The guide should move the web so that the line or edge pattern is always aligned with the line guide's sight point.

Note: If the guide does not follow the movement of the sensor and moves in the opposite direction, then the sensor polarity (parameters 3, 4, or 50) is not correct and must be changed. Refer to page 17 for more information about setting controller parameters.

g) If the guide mechanism oscillates around the guide point or overshoots excessively when steering in response to an abrupt change in web position, the servo gain (parameter 5) is too high and must be lowered. Refer to page 17 for more information about setting controller parameters.

Operation

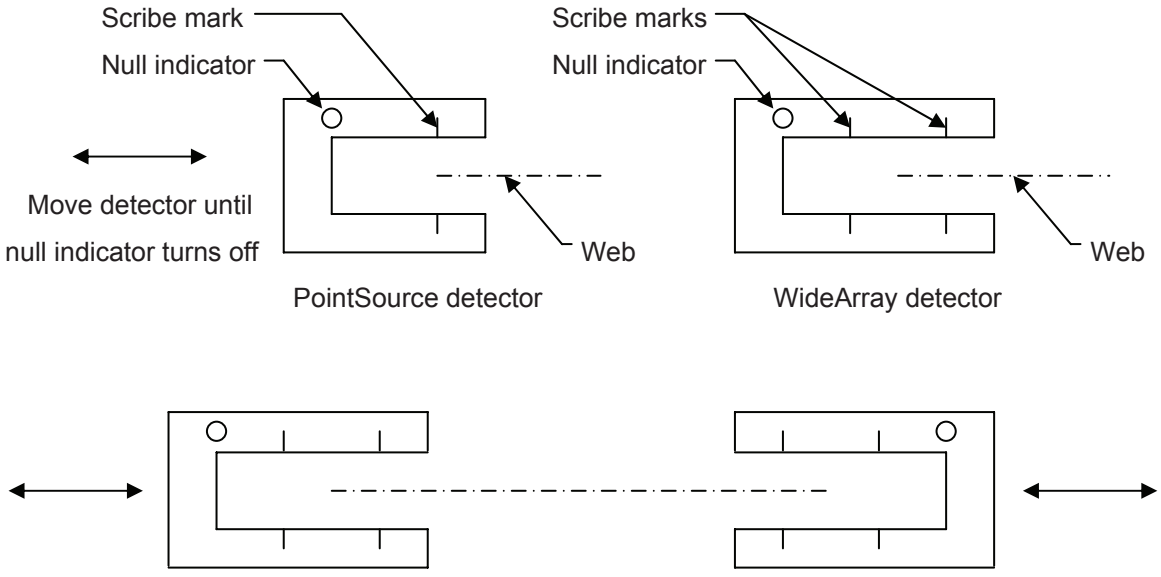
The MICRO 4000 NET may be configured for a wide variety of applications, but most configurations share the same basic operating procedure:

1) Press the SERVO-CENTER button and wait for the web guide to drive to the center of travel.
2) Thread the web through the machine.
3) Position the sensors.

   One edge detector: Place the detector near the edge of the web. Move the detector towards the web until its null indicator LED turns off. **Note:** The scribed lines on the edge detector indicate the approximate location of the detector's guide point.

   Two edge detectors (centerline guiding): Press the EDGE A button. Place detector A near the edge of the web. Move detector A towards the web until its null indicator LED turns off. Press the EDGE B button. Place detector B near the opposite edge of the web. Move detector B towards the web until its null indicator LED turns off. **Note:** The scribed lines on the edge detector indicate the approximate location of the detector's guide point.

   Digital line guide: Position the sensor so that it is approximately centered over the registration line or edge. When it is positioned correctly an indicator dot will appear in the display under the line or edge you want to track. Refer to page 61 for more information about operating the line guide.
4) Press the EDGE A, EDGE B, or LINE button. For Centerline mode (centerline guiding), press the EDGE A and EDGE B buttons simultaneously.
5) Press the AUTOMATIC button. The system will now guide the web.



Centerline guiding with WideArray detectors

Troubleshooting

The following checklist has been provided to assist in the analysis and repair of potential trouble situations with the MICRO 4000 NET system. If a situation occurs that is not described in this list, contact AccuWeb for assistance.

Problem	Solution
The system will not work in Automatic, Manual, or Servo-Center mode.	Check items 1, 2, 3, 4, and 5 in the table below.
When the system is in Automatic mode, the web guide steers the web in the wrong direction.	Check item 6 in the table below.
The system oscillates in Automatic mode even though web is not being pulled through the machine.	Check items 7 and 8 in the table below.
The system is unstable in Automatic mode while pulling web.	Check items 9, 10, 11, and 12 in the table below.
The actuator extends or retracts beyond the actuator's end-of-travel limits then jams.	Check items 13, 14, 15, 16, 17, 18, and 19 in the table below.
The web guide or actuator hits a mechanical stop before reaching the actuator's end-of-travel limit.	Check item 15 in the table below.
The system will not work in Automatic mode but works correctly in Manual and Servo-Center mode.	Check items 20, 21, and 22 in the table below.
While in Automatic mode the web guide or actuator moves too fast or slow in response to large changes in the position of the edge of the web (such as a splice).	Check item 23 in the table below.
While in Manual mode the web guide or actuator moves too fast or too slow.	Check item 24 in the table below.
The numeric display is showing a flashing '99' error code.	If error code is '10', then check item 5 in the table below, else refer to page 42 for more information about error codes.

Item	Description / Repair Procedure
1	**AC power.** If the LED data displays are not lit, check the AC power and repair if not connected.
2	**No output from the PWM motor drive.** Connect a digital voltmeter to the actuator motor leads at J5 terminals 1 and 2. Press the MANUAL button and then press and hold the IN or OUT button. If there is no voltage but the LED data displays are lit, the PWM motor output has failed and the system must be returned for repair.
3	**Actuator failure.** If there is motor voltage present in the previous step but the actuator does not move, the actuator motor or cable has failed. Troubleshoot and repair as required, or return the equipment for repair.

4	**INHIBIT input polarity is set wrong.** Set parameter 19 to the correct value. Refer to page 17 for more information about setting controller parameters.
5	**New software was installed during routine maintenance.** ***or*** **Non-volatile memory contains invalid data or has malfunctioned.** Reset all parameters to their default values: **Caution:** This procedure will erase all previously entered parameter settings! Be sure to record all current settings on page 39 before performing this step. If you are installing new software, then you must record the current settings *before* installing the new microcontroller chip. 1. Turn the AC power *off*. 2. Press and hold the EXIT button. 3. Turn the AC power *on*. 4. When the 'reset' message appears on the numeric display, release the EXIT button. 5. Set parameter 2 (end-of-travel mode) and other parameters to their previous values. Refer to page 17 for more information about setting controller parameters.
6	**Sensor polarity is wrong.** The value of parameter 3, 4, or 50 must be changed for the selected sensor. Refer to page 17 for more information about setting controller parameters.
7	**Servo gain is too high.** Decrease the value of parameter 5. Refer to page 17 for more information about setting controller parameters.
8	**End play in the actuator or mounting.** Press the MANUAL button and then press IN and OUT buttons several times. Actuator operation should be smooth and free, without binding. Firmly grasp the web guide mechanism moving part and push and pull to check for end play. Observe the actuator, mechanical components, and mounting hardware. There should be no observable motion in the mechanical system. If motion is noted, repair the web guide or actuator as required, or return the equipment for repair.
9	**Sensor in wrong position.** **Unwind stand:** The sensor should be located down-web, close to the last shifting idler roll. Refer to the guide application drawings on page 139. **Winder stand:** The sensor should be located up-web before the last fixed idler roll, one to two web widths from the shifting base. Refer to the guide application drawings on page 139. **Intermediate guides:** The sensor should be placed close to the exiting idler roll. Refer to the guide application drawings on page 139.
10	**Excessive chuck wobble.** Decrease the web speed or re-chuck the roll of material.
11	**Web tension is low or tension control varies.** Increase the web tension or repair the tension control.

12	**Excessive web curl.** If web flutter or curl exists, change parameters 6 and 18 to higher values. Refer to page 17 for more information about setting controller parameters.
13	***All actuators.*** **End-of-travel mode is incorrect.** Set parameter 2 to the correct value. Refer to page 17 for more information about setting controller parameters.
14	***All actuators.*** **Actuator cable wires are broken, shorted or connected to wrong terminals of J5.** Refer to the connection diagrams on page 139. Check wiring at J5 and check the actuator cable for broken or shorted wires.
15	***Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT).*** **End-of-travel limits not set correctly.** Parameters 9 and 10 must be adjusted to stop the actuator before the web guide or actuator hits any obstruction. Refer to page 17 for more information about setting controller parameters.
16	***Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT).*** **Potentiometer failure.** Refer to the potentiometer replacement procedure on page 87.
17	***Actuators with limit switches (MM, MME, MN, and MNE).*** **Limit switch failure.** Check the limit switch voltage at J5 terminals 5 and 6 (terminal 10 is GND). This voltage should normally be 0.0 VDC (switch is closed), then jump to +5.0 VDC when the limit is reached (switch opens). If the correct voltages are not present, replace the limit switch in the actuator or return the actuator for repair.
18	***Actuators with limit switches (MX).*** **Limit switch failure.** The end-of-travel limit switches in the MX-series actuators directly control the motor circuit and cannot be monitored externally. If a limit switch has failed, replace the switch or return the actuator for repair.
19	**Reversed motor wires.** Restore the motor wire connections at J5 terminals 1 and 2 to the proper connection. Refer to the connection diagrams on page 139. Change the value of parameters 3, 4, or 50 as required. Refer to page 17 for more information about setting controller parameters.
20	**Edge detector not calibrated.** Refer to page 59 for calibration instructions.
21	***Edge detector:*** **transducers covered with dust or other material.** Clean the edge detector transducer face with a cloth dampened with water or a mild detergent solution. If the contamination cannot be removed with this method, return the edge detector for repair. ***Digital line guide:*** **optics covered with dust or other material.** Clean the underside of the sensor with a soft cloth dampened with water or a cleaning solution suitable for photographic lenses. If the contamination cannot be removed with this method, return the sensor for repair.
22	**Edge detector failure.** Observe the value of parameter 14 or 15 as required. If this value is below 100, the edge detector is failing and must be returned for repair. Refer to page 17 for more information about displaying controller parameter settings.
23	**Auto-mode speed limit setting is incorrect.** Change the value of parameter 7. Refer to page 17 for more information about setting controller parameters.

24	**Manual-mode speed setting is incorrect.** Change the value of parameter 8. Refer to page 17 for more information about setting controller parameters.

Appendix 1 / Motor Drive Calibration

Note: The PWM motor drive module is not easily accessible, however user adjustment is typically not necessary and is not recommended.

PWM Motor Drive

The PWM motor drive converts the system command voltage into a drive voltage for the actuator motor. The motor drive consists of a separate power supply and PWM servo amplifier. This servo amplifier is run in voltage mode for highest response and accuracy. All adjustments are sealed when the system is shipped and should not require adjustment. If adjustment is required, this is easily accomplished using the following procedure:

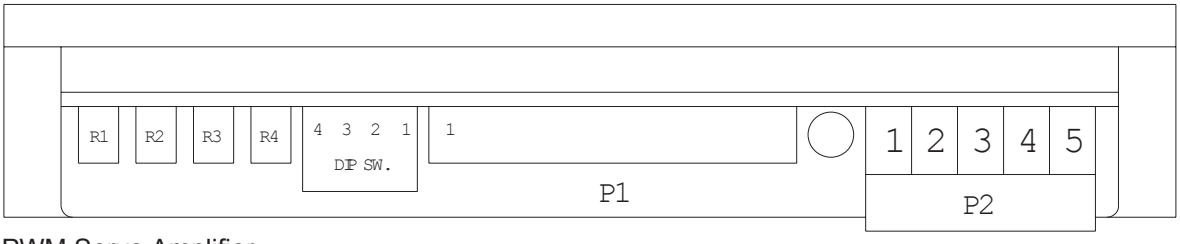
Note: A digital voltmeter (DVM) with at least 2½ digit accuracy will be required during the following procedure.

Adjustment Procedure:

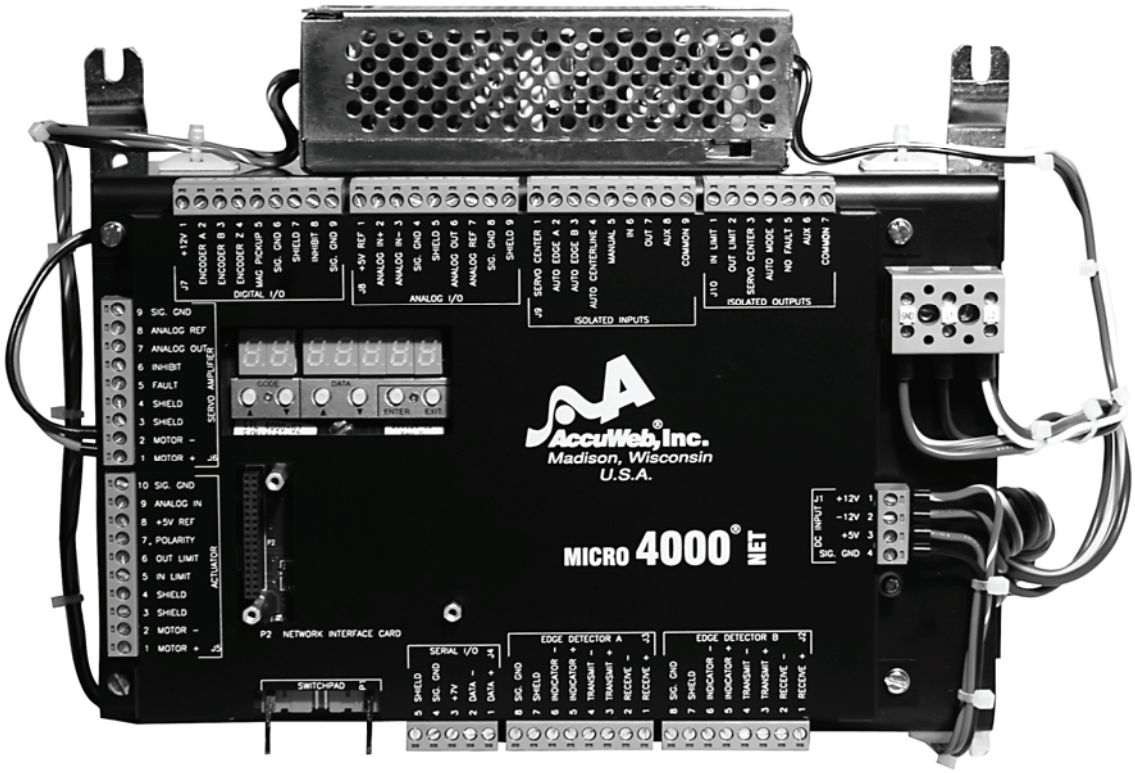
1) Verify that the servo module is configured for voltage mode with the DIP switch set as follows:

Switch	Setting
1	ON
2	OFF
3	OFF
4	OFF

2) Put the system into Manual mode and drive the actuator to ensure that it is not at a limit.
3) Connect the DVM leads to terminals 13 and 14 (motor output).
4) Verify that the DVM reads between +1.00 and -1.00 volts. Adjust R4 (test--offset) on the servo amplifier module if required.
5) Put the system into Automatic mode and verify that the system responds quickly to position errors without oscillation.
6) If a whistling noise is heard from the servo amplifier module, adjust R3 (reference input gain) CCW until it stops.
7) The other potentiometers are adjusted at the factory and do not require further adjustment in the field. *Do not* attempt to adjust these potentiometers.



PWM Servo Amplifier


DIGITAL I/O
ANALOG I/O
ISOLATED INPUTS
ISOLATED OUTPUTS
SERVO AMPLIFIER
ACTUATOR
DC INPUT
AccuWeb, Inc.
Madison, Wisconsin
U.S.A.
MICRO 4000® NET
P2 NETWORK INTERFACE CARD
SERIAL I/O
EDGE DETECTOR A
EDGE DETECTOR B
SWITCHPAD

Introduction

The MICRO 4000 NET controller's main functions include polling the web sensors, end-of-travel sensors, and control inputs, processing the input data, and sending the results to the servo-amplifier and status outputs.

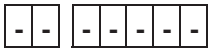
The controller's main features include the following:

- Compatible with all ultrasonic and infrared PointSource and WideArray edge detectors, ultrasonic Hi-Temp edge detectors, and AccuBeam 3 digital line guide. These sensors are described on pages 56 and 61.
- Has a built-in parameter-entry keypad and display.
- Has a variety of digital inputs and outputs that allow the customer's PLC to control its operating modes and monitor its status. These are described on pages 45, 46, and 48. In addition, the controller can be connected to a wide variety of fieldbus networks by installing an optional Fieldbus Interface card. This card is described on page 103.
- Has several analog inputs and outputs that may be used for interfacing to voltage-output sensors, PLCs and other MICRO 4000 NET controllers. A setup procedure for these ports is described on page 50.
- Compatible with the Remote Stations described on pages 89 and 98.

Parameters

The MICRO 4000 NET system is configured by setting programmable parameters. These parameters are stored in non-volatile memory and may be examined or changed by using the parameter-entry keypad and display located on the MICRO 4000 NET board.

Note that the CODE and DATA display will show dashes immediately after power is turned on and after the EXIT button is pressed. The dashes indicate that no parameter is currently selected for examination or adjustment, but that the system is operating normally.



The general procedure for reading and/or changing the parameters is as follows:

1) Press the UP (▲) or DOWN (▼) CODE buttons to select the parameter you want to examine and/or adjust. Each parameter has a unique code number.
2) Press the UP (▲) or DOWN (▼) DATA buttons to adjust the parameter's setting.
3) Press ENTER to store the new data value in non-volatile memory. To leave the data value at its original value press EXIT, or press the UP (▲) or DOWN (▼) CODE buttons.

The parameters are described below:

Software Version

	1		x	x.	x	x

This parameter displays the software version.

End-of-Travel Mode

2 0	*No feedback*. This mode is used when the system has no motor drive output.
2 1	*Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT).* These actuators use a potentiometer to sense actuator position and have adjustable end-of-travel and servo-center limits. **Caution:** To prevent jamming of the actuator make sure the end-of-travel limits are set correctly. Refer to page 85 for more information about setting end-of-travel limits.
2 2	*Actuators with limit switches (MM, MME, MN, and MNE).* These actuators use fixed limit switches to sense actuator position. Their end-of-travel limits are factory set.
2 3	*Actuators with limit switches (MX).* These actuators use fixed limit switches to sense actuator position. Their end-of-travel limits are factory set.

Note: The default setting for this parameter is 4. After resetting all parameters to their default values (refer to page 11, troubleshooting item 5) you must set this parameter to 0, 1, 2, or 3 before setting other parameters and/or operating the system.

Input A Polarity

3 0	The actuator will move Out when edge detector A is *unblocked*, or the digital line guide's sight point is to the *left* of the line or edge it is following. **This is the default setting.**
3 1	The actuator will move Out when edge detector A is *blocked*, or the digital line guide's sight point is to the *right* of the line or edge it is following.

Input B Polarity

4 0	The actuator will move Out when edge detector B is *unblocked*, or the digital line guide's sight point is to the *left* of the line or edge it is following.
4 1	The actuator will move Out when edge detector B is *blocked*, or the digital line guide's sight point is to the *right* of the line or edge it is following. **This is the default setting.**

Servo Gain

5 4 0 Range: 0 to 255	This parameter determines the response time and accuracy of the system. In Automatic mode, the system produces a motor drive voltage proportional to web position error. Higher gain will increase the drive voltage at a given position error. For best response time and accuracy, set the *servo gain* to the highest value that does not produce excessive overshoot or oscillation. **The default value is 40.**

Maximum Deadband

6 | 1 0

Range: 0 to 100

The *maximum deadband* is a zone around the sensor guide point where the motor drive is turned off. The higher the Maximum Deadband value is set, the farther the web edge or line must move away from the guide point before the motor drive is turned on. This parameter is typically used to compensate for edge curl and web flutter. The Maximum Deadband value must be higher than the Minimum Deadband value. **The default value is 10.**

Auto-Mode Speed Limit

7 | 8 0

Range: 0 to 120

This parameter limits the top speed of the actuator in Automatic mode. The higher this value is set, the faster the actuator can move. **The default value is 80.**

Manual-Mode Speed

8 | 8 0

Range: 0 to 120

This parameter determines how fast the actuator will move in Manual and Servo-Center mode. The higher this value is set, the faster the actuator will move. **The default value is 80.**

In End-of-Travel Limit

9 | 6 7

Range: 0 to 255

This parameter works only with actuators that have potentiometer feedback (MT, SF, HL, HF, HT, and UHT). It sets the maximum distance that the actuator can move In. To increase this distance, set this parameter to a lower value. **The default value is 67.**

Important: Refer to page 85 for minimum and maximum values.

Note: Use parameter 26 to examine the current actuator position value.

Out End-of-Travel Limit

1 0 | 1 8 9

Range: 0 to 255

This parameter works only with actuators that have potentiometer feedback (MT, SF, HL, HF, HT, and UHT). It sets the maximum distance that the actuator can move Out. To increase this distance, set this parameter to a higher value. **The default value is 189.**

Important: Refer to page 85 for minimum and maximum values.

Note: Use parameter 26 to examine the current actuator position value.

Servo-Center Position

1 1 | 1 2 8

Range: 0 to 255

This parameter works only with actuators that have potentiometer feedback (MT, SF, HL, HF, HT, and UHT). It sets the home position for the actuator when Servo-Center mode is selected. To move the servo-center position closer to the In limit, set this parameter to a lower value. To move the servo-center position closer to the Out limit, set this parameter to a higher value. **The default value is 128.**

Important: Refer to page 85 for minimum and maximum values.

Note: Use parameter 26 to examine the current actuator position value.

Input A Type

1 2 0	Sensor A is not installed.
1 2 1	Sensor A is an ultrasonic or IR edge detector connected to the Edge Detector A input. **This is the default setting.** **Note:** Set parameter 55 to select sensor type.
1 2 2	Sensor A is a digital line guide connected to the Serial I/O interface.
1 2 3	Sensor A is an external analog device connected to Analog Input 1.

Note: In order to select Input A through the front-panel switchpad, fieldbus or Discrete Isolated Inputs, parameter 12 must be set to 1 or higher.

Input B Type

1 3 0	Sensor B is not installed. **This is the default setting.**
1 3 1	Sensor B is an ultrasonic or IR edge detector connected to the Edge Detector B input. **Note:** Set parameter 56 to select sensor type.
1 3 2	Sensor B is a digital line guide connected to the Serial I/O interface.
1 3 3	Sensor B is an external analog device and is connected to Analog Input 2. **Note:** If parameter 2 is set to 1, then Analog Input 2 must be connected to the actuator's position-sensing potentiometer.

Note 1: In order to select Input B through the front-panel switchpad, fieldbus or Discrete Isolated Inputs, parameter 13 must be set to 1 or higher.

Note 2: In order to select Centerline mode through the front-panel switchpad, fieldbus or Discrete Isolated Inputs, parameters 12 and 13 must both be set to 1 or higher.

Edge Detector A Signal Level

1 4 a a. b b b	This parameter displays edge detector A's signal levels. Digits **aa** display the beam number and digits **bbb** display the signal level. Use the DATA buttons to select the desired beam.

Edge Detector B Signal Level

1 5 a a. b b b	This parameter displays edge detector A's signal levels. Digits **aa** display the beam number and digits **bbb** display the signal level. Use the DATA buttons to select the desired beam.

Edge Detector A Transmit Level

1	6	a	a.	b	b	b

This parameter displays edge detector A's transmit levels. Digits **aa** display the beam number and digits **bbb** display the transmit level. Use the DATA buttons to select the desired beam.

Edge Detector B Transmit Level

1	7	a	a.	b	b	b

This parameter displays edge detector B's transmit levels. Digits **aa** display the beam number and digits **bbb** display the transmit level. Use the DATA buttons to select the desired beam.

Minimum Deadband

1	8					5

Range: 0 to 100

The *minimum deadband* is a zone around the sensor guide point that the web edge or line must enter before the motor drive is turned off. Once the web edge or line position enters this zone, it must then move outside of the *maximum deadband* zone before the motor drive is turned on. The Minimum Deadband value must be lower than the Maximum Deadband value. **The default value is 5.**

INHIBIT Input Mode

Refer to page 45 for more information about the INHIBIT input.

1	9					0

The actuator will run only if the INHIBIT input is activated. The INHIBIT input controls the actuator in Automatic, Manual, or Servo-Center mode.

1	9					1

Same function as option 0, except the polarity of the INHIBIT input is inverted. **This is the default setting.**

1	9					2

The actuator will run only if the INHIBIT input is activated. The INHIBIT input controls the actuator only in Automatic mode.

1	9					3

Same function as option 2, except the polarity of the INHIBIT input is inverted.

Note: If your application requires an opto-isolated INHIBIT input, then set parameter 72 to 1.

Calibrate Edge Detector A

2	0					0

Range: 0 to 2

This parameter initiates the calibration of edge detector A. Refer to page 59 for calibration instructions.

Calibrate Edge Detector B

2	1					0

Range: 0 to 2

This parameter initiates the calibration of edge detector B. Refer to page 59 for calibration instructions.

Edge Detector A Blocked Level

2	2					0

Range: 0 to 255

This parameter determines the blocked signal level for edge detector A and is automatically set by the edge detector calibration procedure. **The default value is 0.**

This parameter value should not be changed manually.

Edge Detector B Blocked Level

2	3					0

Range: 0 to 255

This parameter determines the blocked signal level for edge detector B and is automatically set by the edge detector calibration procedure. **The default value is 0.**

This parameter value should not be changed manually.

Sensor A Length

2	4					2

Range: 2 to 128

This parameter configures the system for the number of sensing beams in sensor A. **The default value is 2.**

Refer to the table of sensor models on page 58.

Note: To reduce the sensing area of a WideArray detector, change parameter 76.

Sensor B Length

2	5					2

Range: 2 to 128

This parameter configures the system for the number of sensing beams in sensor B. **The default value is 2.**

Refer to the table of sensor models on page 58.

Note: To reduce the sensing area of a WideArray detector, change parameter 77.

Actuator Position Display

This parameter displays the position of the actuator. The display format depends on the type of actuator installed:

2	6					0

Range: 0 to 255

Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT). The data display indicates the position of the actuator's end-of-travel potentiometer.

2	6			a	b	c

Actuators with limit switches (MM, MME, MN, and MNE). The data display indicates the state of the actuator's limit switches:

a = IN limit switch (0 = activated, 1 = deactivated)

b = POLARITY switch (0 = activated, 1 = deactivated)

c = OUT limit switch (0 = activated, 1 = deactivated)

2	6			a	b	c

Actuators with limit switches (MX). The data display indicates the state of the actuator's limit switches:

a = don't care

b = don't care

c = OUT POLARITY switch (0 = activated, 1 = deactivated)

Power-Up Mode

27 0	The system will power-up in the same operating mode that was selected when last powered-down. All inputs are momentary. **This is the default setting.**
27 1	The system will power-up in Manual mode. All inputs are momentary.
27 2	The system will power-up in Servo-Center mode. All inputs are momentary.
27 3	The system will power-up in Automatic mode. All inputs are momentary.
27 4	The system will power-up in Manual mode. All inputs are *maintained*.
27 5	The system will power-up in Manual mode and Edge A (Input A) will be selected. All inputs are momentary.
27 6	The system will power-up in Manual mode and Edge B (Input B) will be selected. All inputs are momentary.
27 7	The system will power-up in Manual mode and Line (Input C) will be selected. All inputs are momentary.
27 8	The system will power-up in Manual mode and Edge A and Edge B will be selected (Centerline mode). All inputs are momentary.

Note: This parameter also affects the operation of the Discrete Isolated Inputs (page 46).

Parameter 28 is reserved for future use.

System ID

29 x x x x x	This parameter displays the system ID number.

Password

30 0 Range: 0 to 255	This parameter is used for enabling optional software features. To purchase and install optional features, contact AccuWeb for assistance.

Note: To see which features are enabled, set parameter 29 to 1. The displayed data value indicates which feature is enabled: 0 = none, 1 = oscillation, 2 = web width monitor, 4 = integrator.

Refer to page 43 for a description of parameters 31, 32, 33, and 34.

LED Indicator Mode

3 5 0 The front-panel switchpad LEDs and edge detector null indicator LEDs are enabled.

In this mode one or both null LEDs may be operational depending on which edge detector is selected by the switchpad, fieldbus, or Discrete Isolated Inputs.

If Edge A is selected, then edge detector A's null LED indicates the position of web edge A and detector B's null LED is off.

If Edge B is selected, then edge detector B's null LED indicates the position of web edge B and detector A's null LED is off.

If Edge A and Edge B are both selected (Centerline mode), then edge A's null LED and edge B's null LED operate in tandem and indicate the position of the web's centerline.

This is the default setting.

3 5 1 The switchpad LEDs and edge detector null indicator LEDs are enabled.

In this mode each edge detector null LED indicates the position of the web sensed by that detector alone, and both null LEDs are always operational.

3 5 2 The switchpad LEDs are enabled and the edge detector null indicator LEDs are always off. **Use this setting if the web is photosensitive.**

3 5 3 The switchpad LEDs and edge detector null indicator LEDs are always off. **Use this setting if the web is photosensitive.**

Sensor A Gap

3 6 0 Sensor A has a 1.5 inch gap.

3 6 1 Sensor A has a 4.0 inch gap. **This is the default setting.**

3 6 2 Sensor A has an 8.0 inch gap.

Sensor B Gap

3 7 0 Sensor B has a 1.5 inch gap.

3 7 1 Sensor B has a 4.0 inch gap. **This is the default setting.**

3 7 2 Sensor B has an 8.0 inch gap.

Analog Output 1

38 0	The output voltage is 0.0 volts. **This is the default setting.**
38 1	The output voltage is proportional to the motor drive command signal. The output voltage range is –10 to +10 volts.
38 2	The output voltage is proportional to the signal read by Input A, Input B, Input C or the centerline combination of Inputs A and B. The inputs are selected by the front-panel switchpad, fieldbus, or Discrete Isolated Inputs. The output voltage range is –10 to +10 volts.
38 3	Same function as option 2, except the output voltage range is 0 to +10 volts.
38 4	The output voltage is proportional to the signal read by Input A. The output voltage range is –10 to +10 volts.
38 5	Same function as option 4, except the output voltage range is 0 to +10 volts.
38 6	The output voltage is proportional to the signal read by Input B. The output voltage range is –10 to +10 volts.
38 7	Same function as option 6, except the output voltage range is 0 to +10 volts.
38 8	The output voltage is proportional to the web width. The remote station sets the output voltage range.
38 9	The output voltage is proportional to the voltage at Analog Input 1. The output voltage range is -10 to +10 volts.
38 10	Same function as option 9, except the output voltage range is 0 to +10 volts.
38 11	The output voltage is proportional to the voltage at Analog Input 2. The output voltage range is -10 to +10 volts.
38 12	Same function as option 11, except the output voltage range is 0 to +10 volts.
38 13	The output voltage is proportional to the guide point value. The output voltage range is -10 to +10 volts.
38 14	Same function as option 13, except the output voltage range is 0 to +10 volts.
38 15	This option is used in resolving-centerline systems only. The output voltage drives the resolver's controller. The output voltage range is -10 to +10 volts.
38 16	Same function as option 15, except the output voltage range is 0 to +10 volts.

[continued on next page]

3 8 1 7	This option is used for controlling a servo-valve. The output voltage reacts to positive web error only. The output voltage range is 0 to +10 volts.
3 8 1 8	This option is used for controlling a servo-valve. The output voltage reacts to negative web error only. The output voltage range is 0 to +10 volts.

Note: For option 1 the output voltage range and scale depend on several parameters, including Input Polarity, Servo Gain, Minimum Deadband, Maximum Deadband, and Auto-Mode Speed Limit. Options 2 through 7 automatically scale the full sensing range of the sensor to the full range of the analog output, and options 2 and 3 are also affected by Input Polarity.

Analog Output 2 (servo-amplifier command signal)

3 9 0	The output voltage is 0.0 volts.
3 9 1	The output voltage is proportional to the motor drive command signal. The output voltage range is –10 to +10 volts. **This is the default setting.**
3 9 2	The output voltage is proportional to the signal read by Input A, Input B, Input C or the centerline combination of Inputs A and B. The inputs are selected by the front-panel switchpad, fieldbus, or Discrete Isolated Inputs. The output voltage range is –10 to +10 volts.
3 9 3	Same function as option 2, except the output voltage range is 0 to +10 volts.
3 9 4	The output voltage is proportional to the signal read by Input A. The output voltage range is –10 to +10 volts.
3 9 5	Same function as option 4, except the output voltage range is 0 to +10 volts.
3 9 6	The output voltage is proportional to the signal read by Input B. The output voltage range is –10 to +10 volts.
3 9 7	Same function as option 6, except the output voltage range is 0 to +10 volts.
3 9 8	The output voltage is proportional to the web width. The remote station sets the output voltage range.
3 9 9	The output voltage is proportional to the voltage at Analog Input 1. The output voltage range is -10 to +10 volts.
3 9 1 0	Same function as option 9, except the output voltage range is 0 to +10 volts.
3 9 1 1	The output voltage is proportional to the voltage at Analog Input 2. The output voltage range is -10 to +10 volts.

[continued on next page]

39 12	Same function as option 11, except the output voltage range is 0 to +10 volts.
39 13	The output voltage is proportional to the guide point value. The output voltage range is -10 to +10 volts.
39 14	Same function as option 13, except the output voltage range is 0 to +10 volts.
39 15	This option is used in resolving-centerline systems only. The output voltage drives the resolver's controller. The output voltage range is -10 to +10 volts.
39 16	Same function as option 15, except the output voltage range is 0 to +10 volts.
39 17	This option is used for controlling a servo-valve. The output voltage reacts to positive web error only. The output voltage range is 0 to +10 volts.
39 18	This option is used for controlling a servo-valve. The output voltage reacts to negative web error only. The output voltage range is 0 to +10 volts.

Note: For option 1 the output voltage range and scale depend on several parameters, including Input Polarity, Servo Gain, Minimum Deadband, Maximum Deadband, and Auto-Mode Speed Limit. Options 2 through 7 automatically scale the full sensing range of the sensor to the full range of the analog output, and options 2 and 3 are also affected by Input Polarity.

Analog Offset

40 0	The analog offset is off. **This is the default setting.**
40 1	The analog offset source is Analog Input 1. The analog offset polarity is **not** inverted.
40 2	The analog offset source is Analog Input 1. The analog offset polarity is inverted.
40 3	The analog offset source is Analog Input 2. The analog offset polarity is **not** inverted.
40 4	The analog offset source is Analog Input 2. The analog offset polarity is inverted.

Analog Input 1 Range

41 0	Analog input 1 is off. **This is the default setting.**

[continued on next page]

4 1 _ _ _ _ 1	The range of Analog Input 1 is 0 to +5 volts.
4 1 _ _ _ _ 2	The range of Analog Input 1 is 0 to +10 volts.
4 1 _ _ _ _ 3	The range of Analog Input 1 is -10 to +10 volts.

Analog Input 2 Range (actuator position signal)

4 2 _ _ _ _ 0	If parameter 2 is set to 1, then the range of Analog Input 2 is automatically set to 0 to +5 volts. If parameter 2 is *not* set to 1, then Analog Input 2 is off. **This is the default setting.**
4 2 _ _ _ _ 1	The range of Analog Input 2 is 0 to +5 volts.
4 2 _ _ _ _ 2	The range of Analog Input 2 is 0 to +10 volts.
4 2 _ _ _ _ 3	The range of Analog Input 2 is -10 to +10 volts.

Analog Input 1 Scale Factor (coarse)

4 3 a a a b b

Range: 0 to 25599

This parameter sets the scale factor for Analog Input 1. Use this parameter to adjust digits **aaa**. Use parameter 44 to adjust digits **bb**.

The default value is 100.

Analog Input 1 Scale Factor (fine)

4 4 a a a b b

Range: 0 to 25599

This parameter sets the scale factor for Analog Input 1. Use this parameter to adjust digits **bb**. Use parameter 43 to adjust digits **aaa**.

The default value is 100.

Analog Input 2 Scale Factor (coarse)

4 5 a a a b b

Range: 0 to 25599

This parameter sets the scale factor for Analog Input 2. Use this parameter to adjust digits **aaa**. Use parameter 46 to adjust digits **bb**.

The default value is 100.

Analog Input 2 Scale Factor (fine)

4 6 a a a b b

Range: 0 to 25599

This parameter sets the scale factor for Analog Input 2. Use this parameter to adjust digits **bb**. Use parameter 45 to adjust digits **aaa**.

The default value is 100.

Edge-Loss and Line-Loss Detection

47 0	Edge-loss and line-loss detection are disabled. **This is the default setting.**
47 1	Edge-loss and line-loss detection are enabled. The actuator will stop and the NO FAULT output will turn off when *any* active sensor enters the edge-loss or line-loss state. The edge-loss or line-loss state occurs when an edge detector becomes completely blocked or unblocked, or the digital line guide loses the line or edge it is following. Guiding will resume and the NO FAULT output will turn on when *all* sensors have left the edge-loss or line-loss state.
47 2	Line-loss detection is enabled. When the line guide loses the line, edge detector A will record the position of the web, the system will switch from Line mode to Edge A mode, and edge detector A will then maintain the web at the recorded position. When the line guide reacquires the line, the system will switch back to Line mode.
47 3	Line-loss detection is enabled. When the line guide loses the line, edge detector B will record the position of the web, the system will switch from Line mode to Edge B mode, and edge detector B will then maintain the web at the recorded position. When the line guide reacquires the line, the system will switch back to Line mode.
47 4	Line-loss detection is enabled. When the line guide loses the line, edge detectors A and B will record the position of the web, the system will switch from Line mode to Centerline mode, and edge detectors A and B will then maintain the web at the recorded position. When the line guide reacquires the line, the system will switch back to Line mode.
47 5	Line-loss detection is enabled. When the line guide loses the line, the system will switch from Line mode to Edge A mode, and edge detector A will then maintain the web at the position specified by Offset 2. When the line guide reacquires the line, the system will switch back to Line mode.
47 6	Line-loss detection is enabled. When the line guide loses the line, the system will switch from Line mode to Edge B mode, and edge detector B will then maintain the web at the position specified by Offset 2. When the line guide reacquires the line, the system will switch back to Line mode.
47 7	Line-loss detection is enabled. When the line guide loses the line, the system will switch from Line mode to Centerline mode, and edge detectors A and B will then maintain the web at the position specified by Offset 2. When the line guide reacquires the line, the system will switch back to Line mode.

Servo Gain and Speed Limit Source

48 0	Servo Gain is controlled by parameter 5. Auto-Mode Speed Limit is controlled by parameter 7. **This is the default setting.**
48 1	Servo Gain and Auto-Mode Speed Limit are controlled by the optional Fieldbus Interface (page 103).
48 2	Servo Gain is controlled by Analog Input 1. Auto-Mode Speed Limit is controlled by parameter 7.
48 3	Servo Gain is controlled by parameter 5. Auto-Mode Speed Limit is controlled by Analog Input 1.

Input C Type

49 0	Sensor C is not installed. **This is the default setting.**
49 1	Sensor C is an ultrasonic or IR edge detector connected to the Edge Detector A input. **Note:** Set parameter 55 to select sensor type.
49 2	Sensor C is a digital line guide connected to the Serial I/O interface.
49 3	Sensor C is an external analog device connected to Analog Input 1.

Note: In order to select Input C through the front-panel switchpad, fieldbus, or Discrete Isolated Inputs, parameter 49 must be set to 1 or higher.

Input C Polarity

50 0	The actuator will move Out when edge detector A is *unblocked*, or the digital line guide's sight point is to the *left* of the line or edge it is following. **This is the default setting.**
50 1	The actuator will move Out when edge detector A is *blocked*, or the digital line guide's sight point is to the *right* of the line or edge it is following.

Switchpad Type

5 1 _ _ _ _ **0** — Select this option if the input selection buttons on the front-panel switchpad are labeled EDGE A, CENTERLINE, and EDGE B.

The EDGE A button selects Input A.

The EDGE B button selects Input B.

The CENTERLINE button selects Inputs A and B.

This switchpad does not allow the selection of Input C.

5 1 _ _ _ _ **1** — Select this option if the input selection buttons on the front-panel switchpad are labeled EDGE A, EDGE B, and LINE.

The EDGE A button selects Input A.

The EDGE B button selects Input B.

The LINE button selects Input C.

To select Centerline mode, press the EDGE A and EDGE B buttons simultaneously.

5 1 _ _ _ _ **2** — Front-panel switchpad operation is the same as option 1.

Bit 7 of the fieldbus Operating Mode Command word selects Automatic mode. Refer to page 103 for more information about the Fieldbus Interface. **This is the default setting.**

Note: This parameter also affects the operation of the Discrete Isolated Inputs (page 46).

AUXILIARY Input Function

Refer to page 46 for more information about the AUXILIARY input.

5 2 _ _ _ _ **0** — The AUXILIARY input is off. **This is the default setting.**

5 2 _ _ _ _ **1** — The AUXILIARY input determines which offset is active. To select Offset 2, activate the AUXILIARY input. To select Offset 1, deactivate the AUXILIARY input.

5 2 _ _ _ _ **2** — Same function as option 1, except the polarity of the AUXILIARY input is inverted.

5 2 _ _ _ _ **3** — Activating the AUXILIARY input will enable Oscillation, and deactivating it will disable Oscillation. Oscillation parameter 31 must be set to 1 or higher.

Refer to page 43 for more information about the oscillation function.

5 2 _ _ _ _ **4** — Same function as option 3, except the polarity of the AUXILIARY input is inverted.

5 2 _ _ _ _ **5** — Activating the AUXILIARY input will switch the system to Automatic mode.

5 2 _ _ _ _ **6** — Same function as option 5, except the polarity of the AUXILIARY input is inverted.

[continued on next page]

52 7	Activating the AUXILIARY input will set Offset 1 to the current web position. This is typically done only during job set-up, when the system is in Manual or Servo-Center mode. **Note:** To reset Offset 1 to its default value, select parameter 60, then press the EXIT key.
52 8	Same function as option 7, except the polarity of the AUXILIARY input is inverted.
52 9	Activating the AUXILIARY input will set Offset 2 to the integrator's input value and will reset the integrator output. This is typically done only during job set-up, when the system is in Manual or Servo-Center mode. **Note:** To reset Offset 2 to its default value, select parameter 61, then press the EXIT key.
52 10	Same function as option 9, except the polarity of the AUXILIARY input is inverted.
52 11	Activating the AUXILIARY input will switch the system to Servo-Center mode. The system will return to the previous operating mode when the AUXILIARY input is deactivated.
52 12	Same function as option 11, except the polarity of the AUXILIARY input is inverted.
52 13	Activating the AUXILIARY input will switch the system to Servo-Center mode. The system will remain in Servo-Center mode when the AUXILIARY input is deactivated.
52 14	Same function as option 13, except the polarity of the AUXILIARY input is inverted.
52 15	This option is used only for configuring the guide's AUXILIARY input in resolving-centerline systems. The AUXILIARY input must be connected to the resolver's AUXILIARY output.
52 16	Same function as option 15, except the polarity of the AUXILIARY input is inverted.

Note: If your application requires a non-isolated AUXILIARY input, then set parameter 72 to 1.

Refer to page 43 for a description of parameter 53.

Drive Configuration

54 0	Standard system. The servo-amplifier can be controlled by all inputs. **This is the default setting.**
54 1	The servo-amplifier can be controlled only by Input C and the integrator inputs.
54 2	The servo-amplifier can be controlled only by the integrator inputs.

Sensor A Type

55 0	Sensor A is an ultrasonic edge detector. **This is the default setting.**
55 1	Sensor A is an IR edge detector.
55 2	Sensor A is a Hi-Temp ultrasonic edge detector.

Sensor B Type

56 0	Sensor B is an ultrasonic edge detector. **This is the default setting.**
56 1	Sensor B is an IR edge detector.
56 2	Sensor B is a Hi-Temp ultrasonic edge detector.

Servo-Amplifier Fault

57 0	The SERVO-AMPLIFIER FAULT input is ignored. **This is the default setting.**
57 1	If the SERVO-AMPLIFIER FAULT input is high (+5 VDC) and the SERVO-AMPLIFIER INHIBIT output is not activated, then the controller will display a flashing error code. Refer to page 42 for more information about error codes.
57 2	If the SERVO-AMPLIFIER FAULT input is low (0 VDC) and the SERVO-AMPLIFIER INHIBIT output is not activated, then the controller will display a flashing error code. Refer to page 42 for more information about error codes.
57 3	If the SERVO-AMPLIFIER FAULT input is high (+5 VDC), then the controller will display a flashing error code. Refer to page 42 for more information about error codes.
57 4	If the SERVO-AMPLIFIER FAULT input is low (0 VDC), then the controller will display a flashing error code. Refer to page 42 for more information about error codes.

AUXILIARY Output Function

Refer to page 48 for more information about the AUXILIARY output.

58 0	The AUXILIARY output is off. **This is the default setting.**
58 1	The AUXILIARY output is on when Sensor A is nulled.

[continued on next page]

5 8 _ _ _ _ 2	The AUXILIARY output is on when Sensor B is nulled.
5 8 _ _ _ _ 3	The AUXILIARY output is on when the system is nulled.
5 8 _ _ _ _ 4	This option is used only for configuring the resolver's AUXILIARY output in resolving-centerline systems. The AUXILIARY output must be connected to the guide's AUXILIARY input.

Centerline Configuration

5 9 _ _ _ _ 0	When Centerline mode is selected, the system will calculate Input A + Input B.
5 9 _ _ _ _ 1	When Centerline mode is selected, the system will calculate (Input A + Input B) / 2. **This is the default setting.**

Offset 1

6 0 1 6 3 8 4 Range: 1 to 32767	This parameter allows Offset 1 to be examined and modified. Offset 1 is also accessible through the optional Remote Station or Fieldbus Interface. To reset Offset 1 to its default value, press the EXIT key. **The default value is 16384.**

Offset 2

6 1 1 6 3 8 4 Range: 1 to 32767	This parameter allows Offset 2 to be examined and modified. Offset 2 is also accessible through the optional Remote Station or Fieldbus Interface. To reset Offset 2 to its default value, press the EXIT key. **The default value is 16384.**

Manual Polarity

6 2 _ _ _ _ 0	The actuator extends when the In mode is selected, and retracts when the Out mode is selected.
6 2 _ _ _ _ 1	The actuator extends when the Out mode is selected, and retracts when the In mode is selected. **This is the default setting.**

Integrator Mode

6 3 _ _ _ _ 0	The integrator function is off. **This is the default setting.**
6 3 _ _ _ _ 1	This mode is used for applications that require complex control of the system guide point, but without integration or dampening.

[continued on next page]

6 3 _ _ _ _ 2	This mode is used for stabilizing the response of guides that have sensors located downstream. The downstream sensors are connected to Integrator Input 1 and 2 and the local sensors are connected to Input A, B, and C. During operation the integrator output slowly changes the local guide point as long as the downstream sensors indicate that the web is not at the downstream guide point. **Note:** This mode is available only if the integrator option is installed. Contact AccuWeb for availability.
6 3 _ _ _ _ 3	This mode is used for dampening the response of the slave guide in chaser-slave systems. The chaser sensors are connected to Integrator Input 1 and 2 and the slave sensors are connected to Input A, B, and C. During operation the chaser sensors establish the slave guide point, but the integrator dampens noise and jitter in the chaser signal.

Integrator Input 1 Type

This parameter selects the source for Integrator Input 1.

6 4 _ _ _ _ 0	No input (zero).
6 4 _ _ _ _ 1	Sensor 1.
6 4 _ _ _ _ 2	Sensor 2. **This is the default setting.**
6 4 _ _ _ _ 3	Digital line guide.
6 4 _ _ _ _ 4	Analog Input 1 (scaled by parameters 43 and 44).
6 4 _ _ _ _ 5	Analog Input 2 (scaled by parameters 45 and 46).

Integrator Input 2 Type

This parameter selects the source for Integrator Input 2.

6 5 _ _ _ _ 0	No input (zero). **This is the default setting.**
6 5 _ _ _ _ 1	Sensor 1.
6 5 _ _ _ _ 2	Sensor 2.
6 5 _ _ _ _ 3	Digital line guide.

[continued on next page]

6 5 _ _ _ _ 4	Analog Input 1 (scaled by parameters 43 and 44).
6 5 _ _ _ _ 5	Analog Input 2 (scaled by parameters 45 and 46).

Integrator Input 1 Polarity

6 6 _ _ _ _ 0	Integrator Input 1 is not inverted. **This is the default setting.**
6 6 _ _ _ _ 1	Integrator Input 1 is inverted.

Integrator Input 2 Polarity

6 7 _ _ _ _ 0	Integrator Input 2 is not inverted. **This is the default setting.**
6 7 _ _ _ _ 1	Integrator Input 2 is inverted.

Integrator Rate

6 8 _ _ 0. 0 1

Range: .001 to .255

This parameter sets the rate that the integrator output changes in response to an input signal. In a typical application the integrator controls the system guide point, so this parameter is scaled in units of inches-per-second per inch of input error. For example, if the input sensors measure an error of 2.0 inches and the integrator rate is set to 0.1, then the integrator output will change at a rate of 0.2 inches-per-second. **The default value is .01**

Integrator Limit

6 9 _ _ 1. 0 0

Range: .01 to 1.00

This parameter sets the maximum rate that the integrator output can change. In a typical application the integrator controls the system guide point, so this parameter is scaled in units of inches-per-second. **The default value is 1.00**

Integrator Input Gain

7 0 _ _ _ _ 0	This option sets the integrator input gain to 1. Use this option if the integrator inputs are connected to only one sensor. **This is the default setting.**
7 0 _ _ _ _ 1	This option sets the integrator input gain to 0.5. Use this option if Integrator Input 1 and 2 are connected to a pair of sensors configured for centerline operation.

Integrator Input Offset

71 0	The integrator input is not offset. **This is the default setting.**
71 1	This option offsets the integrator input using Offset 1.
71 2	This option offsets the integrator input using Offset 2.

INHIBIT and AUXILIARY Input Configuration

This parameter swaps the function of the INHIBIT and AUXILIARY inputs. This is useful when your application requires either a non-isolated AUXILIARY input, or an opto-isolated INHIBIT input.

72 0	The INHIBIT function is routed through J7 terminal 8 (non-isolated). The AUXILIARY function is routed through J9 terminal 8 (opto-isolated). **This is the default setting.**
72 1	The INHIBIT function is routed through J9 terminal 8 (opto-isolated). The AUXILIARY function is routed through J7 terminal 8 (non-isolated).

Integrator Rate Multiplier

In a typical application this parameter is used to vary Integrator Rate with line speed.

73 0	The Integrator Rate is equal to the value of parameter 68 (Integrator Rate). **This is the default setting.**
73 1	Analog Input 1 controls the Integrator Rate. At maximum input voltage the rate is equal to 100% of the value of parameter 68. At minimum input voltage the rate is equal to 0% of the value of parameter 68.
73 2	Analog Input 2 controls the Integrator Rate. At maximum input voltage the rate is equal to 100% of the value of parameter 68. At minimum input voltage the rate is equal to 0% of the value of parameter 68.

Sensor A Transducer Orientation

This parameter reverses the order of the transducer beams in Sensor A.

74 0	**This is the default setting.** Beam 1 is located at the end of the transducer closest to the pigtail wiring.
74 1	Beam 1 is located at the end of the transducer farthest from the pigtail wiring.

Sensor B Transducer Orientation

This parameter reverses the order of the transducer beams in Sensor B.

7 5 [ ][ ][ ][ ] 0	**This is the default setting.** Beam 1 is located at the end of the transducer closest to the pigtail wiring.
7 5 [ ][ ][ ][ ] 1	Beam 1 is located at the end of the transducer farthest from the pigtail wiring.

Sensor A Reduced Length

7 6 [ ][ ][ ][ ] 2

Range: 2 to 128

This parameter is used to reduce the sensing area of WideArray sensor A by establishing the number of active beams. As the value of this parameter is lowered the low-numbered beams will be deactivated first, beginning with beam 1. The minimum value for WideArray sensors is 4. The minimum value for PointSource sensors is 2. The maximum value is determined by parameter 24. **The default value is 2.**

Note: Parameter 24 must always be set to the actual full length of sensor A.

Sensor B Reduced Length

7 7 [ ][ ][ ][ ] 2

Range: 2 to 128

This parameter is used to reduce the sensing area of WideArray sensor B by establishing the number of active beams. As the value of this parameter is lowered the low-numbered beams will be deactivated first, beginning with beam 1. The minimum value for WideArray sensors is 4. The minimum value for PointSource sensors is 2. The maximum value is determined by parameter 25. **The default value is 2.**

Note: Parameter 25 must always be set to the actual full length of sensor B.

Fieldbus Swap Bytes

This parameter swaps the high and low bytes of all fieldbus input and output data words.

7 8 [ ][ ][ ][ ] 0	**This is the default setting.** The data bytes are not swapped.
7 8 [ ][ ][ ][ ] 1	The data bytes are swapped.

Appendix 1 / Parameter Summary

Parameter	Description	Range	Default	Setting	Notes
1	Software version	-	-		see note 1
2	End-of-travel mode	0-3	4		
3	Input A polarity	0, 1	0		
4	Input B polarity	0, 1	1		
5	Servo gain	0-255	40		
6	Maximum deadband	0-100	10		
7	Auto-mode speed limit	0-120	80		
8	Manual-mode speed	0-120	80		
9	In end-of-travel limit	0-255	67		
10	Out end-of-travel limit	0-255	189		
11	Servo-Center position	0-255	128		
12	Input A type	0-3	1		
13	Input B type	0-3	0		
14	Edge detector A signal level	-	-	-	see note 1
15	Edge detector B signal level	-	-	-	see note 1
16	Edge detector A transmit level	-	-	-	see note 1
17	Edge detector B transmit level	-	-	-	see note 1
18	Minimum deadband	0-100	5		
19	INHIBIT input mode	0-3	1		
20	Calibrate edge detector A	0-2	0	-	see note 2
21	Calibrate edge detector B	0-2	0	-	see note 2
22	Edge detector A blocked level	0-255	0		see note 2
23	Edge detector B blocked level	0-255	0		see note 2
24	Sensor A length	2-128	2		
25	Sensor B length	2-128	2		
26	Actuator position display	-	-	-	see note 1
27	Power-up mode	0-8	0		
28	not used	0	0	-	not used
29	System ID	0-65535	-	-	see note 4
30	Password	0-255	-	-	see note 4
31	Oscillation mode	0-4	0		see note 5
32	Oscillation total travel	0-7.50	1.00		see note 5
33	Oscillation maximum speed	0-25.5	1.0		see note 5
34	Oscillation speed multiplier	0-100	50		see note 5
35	LED indicator mode	0-3	0		

[continued on next page]

36	Sensor A gap	0-2	1		
37	Sensor B gap	0-2	1		
38	Analog output 1	0-18	0		
39	Analog output 2 (servo-amplifier)	0-18	1		
40	Analog offset	0-4	0		
41	Analog input 1 range	0-3	0		
42	Analog input 2 range (actuator)	0-3	0		
43	Analog input 1 scale factor (coarse)	0–25599	100		
44	Analog input 1 scale factor (fine)	0-25599	100		
45	Analog input 2 scale factor (coarse)	0–25599	100		
46	Analog input 2 scale factor (fine)	0-25599	100		
47	Edge-loss and line-loss detection	0-7	0		
48	Servo gain and speed limit source	0-3	0		
49	Input C type	0-3	0		
50	Input C polarity	0, 1	0		
51	Switchpad type	0-2	2		
52	AUXILIARY input function	0-16	0		
53	Oscillation minimum speed	0-25.5	1.0		see note 5
54	Drive configuration	0-2	0		
55	Sensor A type	0-2	0		
56	Sensor B type	0-2	0		
57	Servo amplifier fault	0-4	0		
58	AUXILIARY output function	0-4	0		
59	Centerline configuration	0, 1	1		
60	Offset 1	1-32767	16384		see note 3
61	Offset 2	1-32767	16384		see note 3
62	Manual polarity	0, 1	1		
63	Integrator mode	0-3	0		see note 6
64	Integrator input 1 type	0-5	2		
65	Integrator input 2 type	0-5	0		
66	Integrator input 1 polarity	0, 1	0		
67	Integrator input 2 polarity	0, 1	0		
68	Integrator rate	.001-.255	.010		
69	Integrator rate limit	.01-1.00	1.00		
70	Integrator input gain	0, 1	0		

[continued on next page]

71	Integrator input offset	0-2	0		
72	AUXILIARY and INHIBIT input config	0, 1	0		
73	Integrator rate multiplier	0-2	0		
74	Sensor A transducer orientation	0, 1	0		
75	Sensor B transducer orientation	0, 1	0		
76	Sensor A reduced length	2-128	2		
77	Sensor B reduced length	2-128	2		
78	Fieldbus swap bytes	0, 1	0		

[1] These parameters are used for monitoring system functions and cannot be changed through the programming keypad.

[2] These parameters are used for calibrating the edge detectors.

[3] These parameters are primarily used for monitoring system functions, but can be changed through the programming keypad.

[4] These parameters are used for installing optional features such as oscillation, web width monitoring and integration. Contact AccuWeb for availability.

[5] These parameters function only if the oscillation option is installed. Contact AccuWeb for availability.

[6] Option 2 is available only if the integrator option is installed. Contact AccuWeb for availability.

Appendix 2 / Error Codes

The MICRO 4000 NET contains several internal diagnostic routines that verify correct operation and identify specific problems if they occur. Any problem with the system will turn off the **No Fault** output and display a flashing '99' error code on the numeric display.

9 9 _ _ _ _ 1	**Servo-amplifier is malfunctioning.** Refer to page 11, troubleshooting item 2.
9 9 _ _ _ _ 2	**Actuator is malfunctioning.** The actuator is not responding to commands from the controller. The most likely causes are: • Parameter 2 is set to the wrong value. Refer to page 17 for more information about setting controller parameters. • The actuator cable is disconnected or has loose wiring screw-terminals or is mis-wired. • The actuator end-of-travel potentiometer or limit switches have failed. • The actuator is mechanically jammed. • The servo-amplifier has loose wiring screw-terminals or has failed.
9 9 _ _ _ 1 0	**New software was installed during routine maintenance** ***or*** **Non-volatile memory contains invalid data or has malfunctioned.** Reset all parameters to their default values. Refer to page 11, troubleshooting item 5.

Note: To clear the error code, press the EXIT button. If this does not work, turn the AC power off, wait until the switchpad LEDs turn off, then turn the AC power on. If the error code persists, contact AccuWeb for assistance. Refer to page 136 for servicing information.

Appendix 3 / Oscillation Function (Optional)

This optional software feature allows the user to perform web oscillation electronically, thus replacing the mechanical hardware normally required for this function.

Web oscillation is primarily used for processing materials that need oscillation to reduce gauge-band build-up on re-wind rolls.

Web oscillation is accomplished by electronically moving the guide point to oscillate the web over a wide range of speeds and travel distance. The oscillation speed and travel can be programmed within the following ranges:

- Oscillation speed: 0 to 25.5 inches per minute
- Oscillation travel: 0 to 7.50 inches (or ± linear actuator stroke)

When the oscillation function is turned off the guide point is fixed. The system moves the web as needed to keep the web's edge or centerline aligned with the fixed guide point.

When the oscillation function is turned on the guide point moves at a programmed speed over a programmed travel distance. The system moves the web continuously to keep the web's edge or centerline aligned with the moving guide point.

The AUXILIARY input can be used to turn the oscillation function on and off (parameter 52, option 3 or 4).

The rate of oscillation can also be controlled by the analog inputs (parameter 31, option 2 or 3). In this mode the oscillation rate is proportional to input voltage. When the input voltage is at the lowest end of its range, the oscillation rate will be at its minimum value (set by parameter 53). When the input voltage is at the highest end of its range, the oscillation rate will be at its highest value (set by parameter 33).

An additional oscillation mode (parameter 31, option 4) permits oscillation without using an edge sensor. This mode continuously oscillates the actuator between its In and Out end-of-travel limits. Oscillation speed is controlled by parameter 7, or by an external analog (parameter 48, option 2 or 3) or fieldbus input (parameter 48, option 1). If using an actuator that has potentiometer feedback (MT, SF, HL, HF, HT, and UHT) the oscillation distance may be adjusted by setting the In and Out end-of-travel limits (parameters 9 and 10). Oscillation distance is fixed for actuators that have limit switches (MM, MME, MN, and MNE). MX-series actuators do not operate in this oscillation mode.

Note: Refer to page 17 for more information about setting controller parameters.

The oscillation function is configured by the following parameters. Refer to page 17 for more information about setting controller parameters.

Oscillation Mode

31 0	The oscillation function is off. **This is the default setting.**
31 1	The oscillation function is on.
31 2	The oscillation function is on and the oscillation speed can be varied from the minimum speed (parameter 53) to the maximum speed (parameter 33) by using the Analog Input 1.
31 3	The oscillation function is on and the oscillation speed can be varied from the minimum speed (parameter 53) to the maximum speed (parameter 33) by using the Analog Input 2.
31 4	The oscillation function is on. The actuator will oscillate between the In and Out end-of-travel limits. This mode will not work with MX-series actuators.

Oscillation Total Travel

32 7.50	This parameter sets the guide point's range of travel distance. This range is symmetrical around the system's fixed guide point. The position of the fixed guide point can be adjusted with the optional Remote Station. The range is from 0 to 7.50 inches (or ±3.75 inches max). **The default setting is 1.00 inch (± 0.50 inch).**

Oscillation Maximum Speed

33 1.0	This parameter sets the guide point's maximum oscillation speed. The range is from 0 to 25.5 inches per minute. **The default setting is 1.0 inch per minute.**

Oscillation Speed Multiplier

34 50	This parameter scales the guide point's oscillation speed by a fixed percentage. The range is from 0 to 100%. **The default setting is 50%.**

Oscillation Minimum Speed

53 1.0	This parameter sets the guide point's minimum oscillation speed. The range is from 0 to 25.5 inches per minute. **The default setting is 1.0 inch per minute.**

Appendix 4 / Inhibit Input

The INHIBIT input allows the actuator to be turned off (inhibited) by a customer-supplied control signal.

There are four customer-selectable INHIBIT operating modes. These modes are controlled by parameter 19. Refer to page 17 for more information about setting controller parameters.

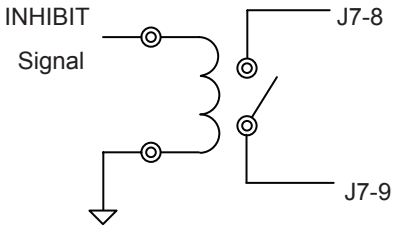
The INHIBIT input requires an isolated contact closure. To activate or deactivate the INHIBIT input, close (short) or open the connection between J7 terminals 8 and 9 (refer to the diagram below).

Note: The INHIBIT input will override all Discrete Isolated inputs. To allow the Discrete Isolated inputs to operate properly, the INHIBIT input must be inactive.

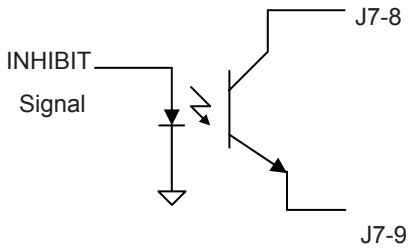
Note: The INHIBIT input is *not* opto-isolated. If your application requires an *opto-isolated* INHIBIT input, then set parameter 72 to 1. Refer to page 17 for more information about setting controller parameters.

Electrical Specifications:

Non-isolated contact-closure input	
Description	This input must be connected to an isolated contact or a sink-connected (NPN) opto-coupled transistor output. It must not be connected to anything else.
Connector	J7
Terminals	8 – Signal input (connect to collector of customer-supplied opto-coupler) 9 – Signal GND (connect to emitter of customer-supplied opto-coupler)
Input voltage	Internally pulled to +5 VDC through a 5 K-ohm resistor
Input current	1 mA to turn on, 0.27 mA or less to turn off
Isolation	None, provided by customer



Relay Control



Solid State Control

Appendix 5 / Discrete Isolated Inputs

The discrete isolated inputs allow the MICRO 4000 NET system to be remotely controlled by the customer's PLC. There are eight control inputs: SERVO-CENTER, EDGE A, EDGE B, LINE / CENTERLINE, MANUAL, IN, OUT, and AUXILIARY. All inputs are opto-isolated.

Warning: It is the responsibility of the customer to insure machine safety. Changing the mode of operation from any source (front-panel switchpad, fieldbus, or Discrete Isolated Inputs) can cause machine motion.

Note: All discrete isolated inputs are opto-isolated, including the AUXILIARY input. If your application requires a *non-isolated* AUXILIARY input, then set parameter 72 to 1. Refer to page 17 for more information about setting controller parameters.

Electrical Specifications:

Discrete Isolated Inputs (per input)	
On-state voltage (activated)	12 VDC minimum 24 VDC nominal 31 VDC maximum
On-state current (activated)	5.0 mA minimum 8.0 mA nominal 14 mA maximum
Off-state voltage (deactivated)	2.7 VDC maximum
Input impedance	2.2 K-ohms minimum
Isolation	30 VAC max. between any terminal and ground
Duration (*momentary* mode only)	100 ms minimum

Operation:

Note: Refer to page 17 for more information about setting controller parameters.

- The control inputs are either *maintained* or *momentary*, depending on the setting of parameter 27.

  In the *maintained* mode, deactivating all inputs will cause the actuator to stop.

  In the *momentary* mode, deactivating all inputs will cause the system to remain in the last valid operating mode. If the system is in Manual mode, deactivating all inputs will cause the actuator to stop. The IN and OUT inputs must be *maintained* in order to move the actuator.

- The function of the AUXILIARY, EDGE A, EDGE B, and LINE / CENTERLINE inputs depends on the setting of parameter 51 and 52.

- The INHIBIT input overrides all Discrete Isolated Inputs. To allow the Discrete Isolated Inputs to operate properly, the INHIBIT input must be inactive.

Discrete Isolated Inputs				
Input	**Connector J9 terminal**	**AUXILIARY Input Function (Param 52)**	**Switchpad Type (Param 51)**	**Action performed when input is activated**
AUXILIARY	8	selects AUTO mode	x	Select Automatic mode (guide the web using position feedback from sensors selected by the EDGE A, EDGE B, or LINE / CENTERLINE inputs).
		other function	x	Select other operating functions. See description of parameter 52.
SERVO-CENTER	1	x	x	Select Servo-Center mode (move actuator to servo-center position).
MANUAL	5	x	x	Select Manual mode (stop actuator).
IN	6	x	x	Select Manual mode and In mode (move actuator in).
OUT	7	x	x	Select Manual mode and Out mode (move actuator out).
EDGE A	2	selects AUTO mode	x	Select Input A.
		other function	x	Select Input A and Automatic mode.
EDGE B	3	selects AUTO mode	x	Select Input B.
		other function	x	Select Input B and Automatic mode.
LINE / CENTERLINE	4	selects AUTO mode	has CENTERLINE button	Select Centerline mode.
		other function	has CENTERLINE button	Select Centerline mode and Automatic mode.
		selects AUTO mode	has LINE button	Select Input C. **Note:** To select Centerline mode, activate the EDGE A and EDGE B inputs simultaneously.
		other function	has LINE button	Select Input C and Automatic mode. **Note:** To select Centerline mode, activate the EDGE A and EDGE B inputs simultaneously.
	9	x	x	This is the connector COMMON. For sourcing to the inputs, connect the - customer supplied voltage. For sinking from the inputs, connect the + customer supplied voltage.

Note: In all tables, ***x*** indicates ***don't care*** or ***not used***.

Appendix 6 / Discrete Isolated Outputs

The discrete isolated outputs allow the MICRO 4000 NET system status to be remotely monitored by a customer's PLC. There are five status outputs: IN LIMIT, OUT LIMIT, SERVO-CENTER LIMIT, AUTO MODE, and NO FAULT. All outputs are opto-isolated.

Warning: It is the responsibility of the customer to insure machine safety. Changing the mode of operation from any source - front-panel switchpad, fieldbus, or Discrete Isolated Inputs - can cause machine motion.

Electrical Specifications:

Discrete Isolated Outputs (per output)	
Maximum customer-supplied voltage	31 VDC between any two terminals
Off-state leakage current	1.0 uA maximum
On-state resistance	2.5 ohms maximum
On-state continuous current	0.4 ADC maximum
On-state peak current	1.2 ADC for 100 msec, repeatable every 2 seconds
Isolation	30 VAC max. between any terminal and ground

Operation:

Discrete Isolated Outputs		
Output	**Connector J10 terminal**	**Description**
IN LIMIT	1	This output is *on* when the actuator has reached the In limit and is *off* during normal operation. This output does not function if a MX-series actuator is installed.
OUT LIMIT	2	This output is *on* when the actuator has reached the Out limit and is *off* during normal operation. This output does not function if a MX-series actuator is installed.
SERVO-CENTER	3	This output is *on* when the actuator is at the servo-center position and is *off* during normal operation.
AUTO MODE	4	This output is *on* when the controller is operating in Automatic mode and is *off* during all other modes of operation.
NO FAULT	5	This output is *on* when the controller is ready to operate and is *off* when any of the following conditions occur: • The controller is displaying an error code. Refer to page 42 for more information about error codes. • AC power is off. • An edge-loss or line-loss condition occurs. This option is enabled by setting parameter 47. Refer to page 17 for more information about setting controller parameters.
AUXILIARY	6	This output is controlled by parameter 58. Refer to page 17 for more information about setting controller parameters.
	7	This is the connector COMMON. For sourcing to the outputs, connect the + customer supplied voltage. For sinking from the outputs, connect the - customer supplied voltage.

Appendix 7 / Analog Inputs and Outputs

This appendix describes how to configure the MICRO 4000 NET controller's analog inputs and outputs.

The MICRO 4000 NET controller has two analog inputs and two analog outputs:

	Terminal Number	Terminal Name	Description
Analog Input 1	J8-1	+5V REF	+5 volt reference output. Connect to end terminal of potentiometer.
	J8-2	ANALOG IN+	Analog input, non-inverting. Connect to potentiometer wiper, or output terminal of sensor or other device.
	J8-3	ANALOG IN-	Analog input, inverting. Typically not used – connect to SIG GND.
	J8-4	SIG GND	Ground reference. Connect to end terminal of potentiometer, or ground terminal of sensor or other device.
Analog Input 2	J5-8	+5V REF	Connect to end terminal of potentiometer.
	J5-9	ANALOG IN	Analog input, non-inverting. Connect to potentiometer wiper, or output terminal of sensor or other device.
	J5-10	SIG GND	Ground reference. Connect to end terminal of potentiometer, or ground terminal of sensor or other device.
Analog Output 1	J8-6	ANALOG OUT	Analog output. Connect to input terminal of other device.
	J8-7	ANALOG REF	Ground reference. Connect to ground terminal of other device.
Analog Output 2	J6-7	ANALOG OUT	Analog output. Connect to input terminal of other device.
	J6-8	ANALOG REF	Ground reference. Connect to ground terminal of other device.

Eleven parameters control the scaling and destination of the input signals and two parameters select the source of the output signals. Refer to page 17 for more information about setting controller parameters. The general procedure for configuring the analog I/O is as follows:

1. Set the Analog Input Range (parameter 41 or 42).
2. Calculate and set the Analog Input Scale Factor (parameters 43 and 44, or 45 and 46).
3. Set the Input Type (parameter 12 or 13).
4. Set the Input Polarity (parameter 3 or 4).
5. Set the Analog Offset (parameter 40).
6. Set the Analog Output (parameter 38 or 39).

There are several examples on the following pages that show how to calculate the Analog Input Scale Factor.

Example # 1: Input a sensor signal from another MICRO 4000 NET controller:

In this example controller # 1's analog input is configured to receive a sensor signal from controller # 2.

- Find the model number of controller # 2's sensor in Table 1 and enter the corresponding parameter values into controller # 1.

  If the sensor signal is connected to Analog Input 1, then enter the values into parameters 43 and 44.

  If the sensor signal is connected to Analog Input 2, then enter the values into parameters 45 and 46.

  Refer to page 17 for more information about setting these parameters.

- Configure controller # 2 to output its sensor signal through one of its analog outputs (set parameter 38 or 39).

Table 1

Sensor Type	Sensor Model Number	Sensing Area Width inches [mm]	Parameter 43 or 45	Parameter 44 or 46
PointSource Ultrasonic E/D	1.5x3U 4043-XX	0.20 [5]	0	20
	3x3U 4050-XX	0.20 [5]	0	20
	4x6U 4060-XX	0.20 [5]	0	20
	4x12U 4090-XX	0.20 [5]	0	20
Ultrasonic WideArray E/D	1.5X3.75U 4612-XX	1.4 [36]	1	40
	4x3.75U 4621-XX	1.4 [36]	1	40
	1.5x5U 4511-XX	2.6 [66]	2	60
	4x5U 4500-XX	2.6 [66]	2	60
	1.5X9U 4524-XX	6.6 [168]	6	60
	4x9U 4520-XX	6.6 [168]	6	60
	4x14U 4530-XX	11.4 [290]	11	40
	4x21U 4540-XX	18.6 [472]	18	60
Hi-Temp Ultrasonic E/D	UT 4068-XX	0.20 [5]	0	20
PointSource Infrared E/D	1.5x3L 4044-XX	0.20 [5]	0	20
	3x3L 4051-XX	0.20 [5]	0	20
	4x6L 4061-XX	0.20 [5]	0	20
	4x12L 4091-XX	0.20 [5]	0	20
Infrared WideArray E/D	1.5x3.75L 4611-XX	1.4 [36]	1	40
	4x3.75L 4620-XX	1.4 [36]	1	40
	1.5x5L 4512-XX	2.6 [66]	2	60
	4x5L 4501-XX	2.6 [66]	2	60

	1.5X9L 4523-XX	6.6 [168]	6	60
	4X9L 4521-XX	6.6 [168]	6	60
	1.5x14L 4534-XX	11.4 [290]	11	40
	4x14L 4532-XX	11.4 [290]	11	40
Digital Line Guide	P/E 5100-XX	0.63 [16]	0	63

Example # 1: [continued]

For sensors not listed in Table 1 use the following formula:

Analog Input Scale Factor = 100 × *W*

- If the sensor signal is connected to Analog Input 1, then enter the result into parameters 43 and 44.

  If the sensor signal is connected to Analog Input 2, then enter the result into parameters 45 and 46.

  Refer to page 17 for more information about setting these parameters.

***W* = Width of sensing area (inches).**

- This is typically the distance between the guide point limits, plus 0.2 inches.

Example # 2: Input a voltage from a third-party sensor:

Calculate the Analog Input Scale Factor using the formula below.

Analog Input Scale Factor = 100 × *F* ÷ *S*

- If the sensor is connected to Analog Input 1, then enter the result into parameters 43 and 44.

  If the sensor is connected to Analog Input 2, then enter the result into parameters 45 and 46.

  Refer to page 17 for more information about setting these parameters.

***F* = Full-scale input range (volts).**

- If the sensor is connected to Analog Input 1, then the value of *F* is determined by parameter 41, as shown in Table 2.

  If the sensor is connected to Analog Input 2, then the value of *F* is determined by parameter 42, as shown in Table 3.

***S* = Sensor output scale factor (volts-per-inch).**

Table 2	
Parameter 41	**Full-Scale Input Range**
0	input 1 is *off*
1	5
2	10
3	20

Table 3	
Parameter 42	**Full-Scale Input Range**
0	see note below
1	5
2	10
3	20

Note: If parameter 2 (end-of-travel mode) is set to 1, then *F* = 5. If parameter 2 is not set to 1, then input 2 is *off*.

Example # 3: Input an end-of-travel potentiometer voltage:

Calculate the Analog Input Scale Factor using the formula below.

Analog Input Scale Factor = 100 × *F* ÷ P

- If the potentiometer is connected to Analog Input 1, then enter the result into parameters 43 and 44.

  If the potentiometer is connected to Analog Input 2, then enter the result into parameters 45 and 46.

  Refer to page 17 for more information about setting these parameters.

***F* = Full-scale input range (volts).**

- If the potentiometer is connected to Analog Input 1, then the value of *F* is determined by parameter 41, as shown in Table 2 on page 54.

  If the potentiometer is connected to Analog Input 2, then the value of *F* is determined by parameter 42, as shown in Table 3 on page 54.

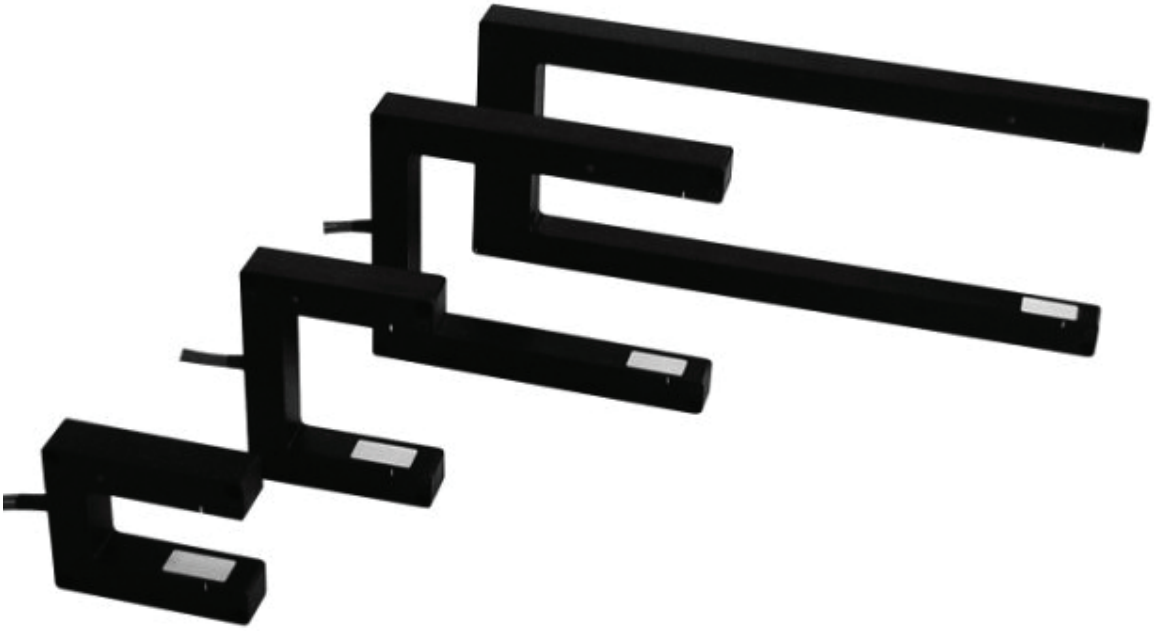
***P* = Potentiometer scale factor (volts-per-inch).**

- If the potentiometer is part of an AccuWeb actuator assembly and is connected to the controller's +5V REF and SIG GND terminals, then refer to Table 4 for the specific potentiometer scale factor value.

Table 4

Actuator Model	Potentiometer Scale Factor	Parameter 43, 45	Parameter 44, 46
MT-1	1.8	2	78
MT-2, SF-2	0.9	5	56
MT-4, SF-4	0.45	11	11
MT-6, SF-6	0.3	16	67
HL-3, HF-3	0.5	10	00
HL-6, HF-6	0.25	20	00
HT-4	0.3	16	67
HT-6	0.3	16	67
UHT-4	0.4	12	50
UHT-6	0.2	25	00
UHT-10	0.2	25	00
UHT-24	0.1	50	00

PointSource™, WideArray™, and Hi-Temp Edge Detectors



Introduction

The MICRO 4000 NET and MICRO 1000 controllers are compatible with AccuWeb's entire range of PointSource and WideArray ultrasonic and infrared edge detectors, and the MICRO 4000 NET is also compatible with the Hi-Temp ultrasonic edge detector. Refer to page 58 for a list of standard models.

PointSource and WideArray Compensated Edge Detectors

- Ultra-compact housing
- Available with sensing areas ranging from 0.2" to 18.6" wide [5mm to 472mm]
- Available with gap widths ranging from 1.5" to 4" [38mm to 102mm]
- Fully compensated for temperature, humidity, dust, and most other process contaminants
- Immune to passline variation and web flutter
- Suitable for long cable length applications
- Intrinsically-safe models available for hazardous environments
- Ultrasonic models are ideal for transparent or opaque film, paper, and foil web materials
- Infrared (IR) models are ideal for non-wovens and other porous web materials

Hi-Temp Compensated Ultrasonic Edge Detector

- Withstands oven temperatures up to 500 deg F [260 deg C]
- Available with waveguide tube lengths up to 84" [213cm]
- Fully compensated for temperature, humidity, dust, and most other process contaminants
- Immune to passline variation and web flutter
- Suitable for long cable length applications
- Intrinsically-safe models available for hazardous environments
- Ideal for transparent or opaque film, paper, and foil web materials

The following table lists all sensor models and the corresponding values for controller parameters 12, 13, 24, 25, 36, and 37. Refer to page 17 for more information about setting controller parameters. Refer to page 61 for more information about the Digital Line Guide.

Sensor Type	Sensor Model Number	Sensing Area Width inches [mm]	Guide Point Adjust Range inches [mm]	Parameter 12, 13, or 49	Parameter 24 or 25	Parameter 36 or 37	Parameter 55 or 56	Notes
PointSource Ultrasonic E/D	1.5x3U 4043-XX	0.2 [5]	0.06 [1.6]	1	2	x	0	
	3x3U 4050-XX	0.2 [5]	0.06 [1.6]	1	2	x	0	
	4x6U 4060-XX	0.2 [5]	0.06 [1.6]	1	2	x	0	
	4x12U 4090-XX	0.2 [5]	0.06 [1.6]	1	2	x	0	
Ultrasonic WideArray E/D	1.5x3.75U 4612-XX	1.4 [36]	1.2 [30]	1	10	0	0	
	4x3.75U 4621-XX	1.4 [36]	1.2 [30]	1	10	1	0	
	1.5x5U 4511-XX	2.6 [66]	2.4 [61]	1	16	0	0	
	4x5U 4500-XX	2.6 [66]	2.4 [61]	1	16	1	0	
	1.5x9U 4524-XX	6.6 [168]	6.4 [163]	1	36	0	0	
	4x9U 4520-XX	6.6 [168]	6.4 [163]	1	36	1	0	
	4x14U 4530-XX	11.4 [290]	11.2 [284]	1	60	1	0	
	4x21U 4540-XX	18.6 [472]	18.4 [467]	1	96	1	0	
Hi-Temp Ultrasonic E/D	UT 4068-XX	0.2 [5]	0.06 [1.6]	1	2	x	2	see note 1
PointSource Infrared E/D	1.5x3L 4044-XX	0.2 [5]	0.06 [1.6]	1	2	x	1	
	3x3L 4051-XX	0.2 [5]	0.06 [1.6]	1	2	x	1	
	4x6L 4061-XX	0.2 [5]	0.06 [1.6]	1	2	x	1	
	4x12L 4091-XX	0.2 [5]	0.06 [1.6]	1	2	x	1	
Infrared WideArray E/D	1.5x3.75L 4611-XX	1.4 [36]	1.2 [30]	1	10	0	1	
	4x3.75L 4620-XX	1.4 [36]	1.2 [30]	1	10	1	1	
	1.5x5L 4512-XX	2.6 [66]	2.4 [61]	1	16	0	1	
	4x5L 4501-XX	2.6 [66]	2.4 [61]	1	16	1	1	
	1.5x9L 4523-XX	6.6 [168]	6.4 [163]	1	36	0	1	
	4x9L 4521-XX	6.6 [168]	6.4 [163]	1	36	1	1	
	1.5x14L 4534-XX	11.4 [290]	11.2 [284]	1	60	0	1	
	4x14L 4532-XX	11.4 [290]	11.2 [284]	1	60	1	1	
Digital Line Guide	P/E 5100-XX	0.63 [16]	0.43 [11]	2	x	x	x	

In the table above, ***x*** indicates ***don't care*** or ***not used***.

[1] The Hi-Temp edge detector is compatible only with the MICRO 4000 NET controller.

Calibration

The compensated ultrasonic, infrared (IR), and Hi-Temp edge detectors may be calibrated to guide materials that are between 15% and 100% opaque to the detectors' sensing beam. During the calibration procedure the microprocessor records the signal level twice: once with the sensing beam unblocked, and then a second time with the sensing beam blocked by the material. After recording the signal levels the microprocessor calculates the opacity of the material and then displays it on the data display. When guiding a variety of materials with different opacities, best results are usually achieved when the system is calibrated for the material with the lowest opacity. Unless otherwise specified, the system is calibrated at the factory for materials with 100% opacity, and this setting is correct for most materials. The following procedure should be performed when unacceptable guiding occurs. Materials with an opacity reading lower than 15% may be guided with acceptable results but sensor resolution will decrease.

Ultrasonic, Infrared, and Hi-Temp Edge Detector Calibration Procedure:

Note: Refer to page 17 for more information about setting controller parameters.

1) Put the system in either Manual or Servo-Center mode.
2) Make sure that the detector is enabled by setting parameter 12, 13, or 49 to 1. The default settings are: detector A enabled, detector B disabled.
3) Clear any obstruction or web material from the detector gap.
4) Set the number on the CODE display to 20 (for detector A), or 21 (for detector B).
5) Set the number on the DATA display to 1 and press the ENTER button. While calibration is in progress the display will count down several times (calibration may take up to a minute with larger WideArray detectors). When done the display will show a number between 100 and 204 for several seconds, followed by a 0 to prompt the next step.
6) Place the web material that is being calibrated in the detector gap and completely cover the transducer area. If calibrating a Hi-Temp detector, cover the open ends of the waveguide tubes with the web material.

   Important: Keep the web material at least 0.25 inch [6 mm] from either transducer during calibration.

7) Set the number on the DATA display to 2 and press the ENTER button. The display will show a number between 0 and 100 for several seconds. This number represents the opacity of the web material.
8) Remove the web material from the detector and wait for 15 seconds before guiding.

   The edge detector is now calibrated.

Maintenance

Ultrasonic Edge Detectors:

The ultrasonic edge detectors require no periodic maintenance. If a loss of unblocked signal level is noticed, cleaning of the transducer faces may be required. Clean the transducer faces with a clean cloth dampened with water or a mild soap solution. DO NOT use harsh solvents as this may damage the transducer.

Infrared Edge Detectors:

For best performance, clean the black optical windows if they become dusty or dirty. Use a clean, soft (non-abrasive) cloth dampened with a mild soap solution or a cleaning solution suitable for camera lenses.

Hi-Temp Edge Detectors:

The Hi-Temp edge detectors require no periodic maintenance. If a loss of unblocked signal level is noticed, cleaning of the waveguide tubes may be required. Use a vacuum cleaner to remove debris accumulated within the tubes and wipe the inner surfaces of the angled reflectors (located on the tips of the tubes) with a clean cloth dampened with water or a mild soap solution.

AccuBeam® 3 Digital Line Guide Sensor

Introduction

This section describes the installation and operation of the AccuBeam 3 Digital Line Guide sensor. The Digital Line Guide uses reflected light to track a registration line printed on the web.

An optional remote station is available for applications where the sensor cannot be easily reached. The remote station duplicates the sensor's switchpad and display, and provides access to all parameters and graphic displays.

The Digital Line Guide provides a line-loss /edge-loss output signal through the MICRO 4000 NET or MICRO 1000 controllers. This option is enabled by setting parameter 47. Refer to page 17 for more information about setting controller parameters.

The Digital Line Guide is compatible with the following controllers and remote station:

MICRO 4000 NET or MICRO 1000 Controllers

The Digital Line Guide requires an interface cable to connect to these controllers. Cables are available in standard lengths of 12' [3.6m], 25' [7.6m], 50' [15.2 m], 75' [22.8m], and 100' [30.5m].

The Digital Line Guide also requires a Serial I/O board (AUX 4249) to connect to the MICRO 1000 Controller.

Auxiliary Remote Station

The Auxiliary Remote Station requires an interface cable and T-box assembly (CON 1000) to connect to the Digital Line Guide.

Product Specifications:

- Sensor size (H x W x D): 3.25" [83mm] x 3.25" [83mm] x 2.13" [54mm]
- Power requirements: Supplied by controller
- Operating environment:

Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90%, Non-condensing

Installation

The Digital Line Guide can be mounted in a variety of ways. Refer to the application drawings and connection drawings on page 139 for installation information.

> **Note:** The Digital Line Guide must be mounted 1.00" [25.4mm] above the web surface, and its sight-point scribe marks must be aligned with the roll center-line as shown in the application drawing.

Sensor and Controller set-up

Note: Refer to page 17 for more information about setting controller parameters.

1) Verify that the parameters in the controller are set correctly. The Digital Line Guide can be configured to use Input A, Input B or Input C:
    - To use Input A (EDGE A), set controller parameter 12 to 2.
    - To use Input B (EDGE B), set controller parameter 13 to 2.
    - To use Input C (LINE), set controller parameter 49 to 2.
2) Press the SERVO-CENTER button on the controller and wait for the guide to move to its center of travel.
3) Attach the Digital Line Guide test pattern (page 83) to the backup roller. Orient the pattern with the direction of web travel as shown.
4) Using the UP and DOWN arrows on the switchpad, select the Calibrate parameter.
5) Rotate the backup roller and/or move the sensor laterally until the test pattern is approximately centered under the sensor.
6) Press the ENTER key then wait until the "Select line/edge" message appears.
7) The test pattern should now appear in the Digital Line Guide's graphic display. If the test pattern line is not approximately centered in the display then move the sensor until the line is centered, or press the DOWN arrow key until the selection window is centered on the line.
8) Press the ENTER key then wait until the sensor has finished saving the new settings.
9) Press the EDGE A, EDGE B or LINE button on the controller, depending on which input the sensor is configured for.
10) Press the AUTOMATIC button on the controller.
11) The guide should now steer the test pattern so that it is always in the center of the Digital Line Guide's field of view. If the guide moves the test pattern off to one side, then the controller's input polarity needs to be changed. Change the setting of controller parameter 3, 4, or 50.
12) Press the SERVO-CENTER button on the controller and wait for the guide to move to its center of travel.
13) Remove the test pattern from the backup roller.

Operation

This section describes the Digital Line Guide's front panel keys and display, and outlines a basic operating procedure.

Display:

- The 2-line LCD display is divided into four fields as shown:

PARAMETER	VALUE
GRAPHIC DISPLAY	CONTRAST

PARAMETER field: Name of the currently selected parameter.

VALUE field: Value of the currently selected parameter.

GRAPHIC DISPLAY field: Graphically displays what is in the sensor's field of view.

CONTRAST field: Contrast value of the highest contrast edges in the sensor's field of view.

- The parameters are described in the Parameters section of this manual (page 72).
- At power-up, a software identification message is displayed for several seconds then the display reverts to the format described above:

		A	**c**	**c**	**u**	**B**	**e**	**a**	**m**		**3**				
		D	**L**	**G**		**x**	**x**	**.**	**x**	**x**					

Front panel keys:

- The front panel keys are defined as follows:

- To select a parameter press the ENTER key until the cursor is in the PARAMETER field, then press the UP or DOWN keys until the desired parameter is displayed.
- To change a parameter's value press the ENTER key until the cursor is in the VALUE field, then press the UP or DOWN keys until the desired value is displayed.
- The keys automatically repeat if held down for more than one second.

Operation:

1) Press the SERVO-CENTER button and wait for the guide to move to its center of travel.
2) Thread the web through the machine.
3) Press the EDGE A, EDGE B, or LINE button.
4) Align the sensor with the line or edge to be tracked on the web material.
5) If this is the first time you are running this particular web material, perform the auto-calibration procedure described in the Calibration section of this manual (page 66).

6) Verify that the web pattern is visible in the sensor's graphic display and that the guide point indicator (a dot) is located under the line or edge you want to track. If the pattern or guide point indicator is not visible, perform the auto-calibration routine described on page 66.

7) Press the AUTOMATIC button. The system will now guide the web.

Calibration

Digital Line Guide Calibration Procedure:

This procedure automatically finds the optimum values for all line and edge tracking parameters. These parameters can also be examined and manually set as described in the Operation section of this manual (page 64). The parameters are described in more detail in the Parameters section of this manual (page 72).

The following steps provide a general outline of the auto-calibration procedure. A more detailed step-by-step procedure using specific examples appears on pages 67 and 69.

1) Position the sensor so that it is approximately centered over the registration line or edge.
2) Select the Calibration parameter and press ENTER to start the auto-calibration procedure.
3) When the “Select line/edge” message appears, a short horizontal line will simultaneously appear in the graphic display. This line is the *selection window*. The selection window can be moved horizontally and made smaller or larger so that you can indicate precisely which line or edge the sensor should track. This feature is particularly useful if there are multiple lines or edges in the sensor’s field of view.
4) Move the selection window over the line or edge you want to track. Adjust the size of the selection window with the UP key and adjust its position with the DOWN key.

> **Note:** It is usually not necessary to adjust the selection window if there is only one line or edge in the sensor’s field of view and the sensor has been centered over this feature.

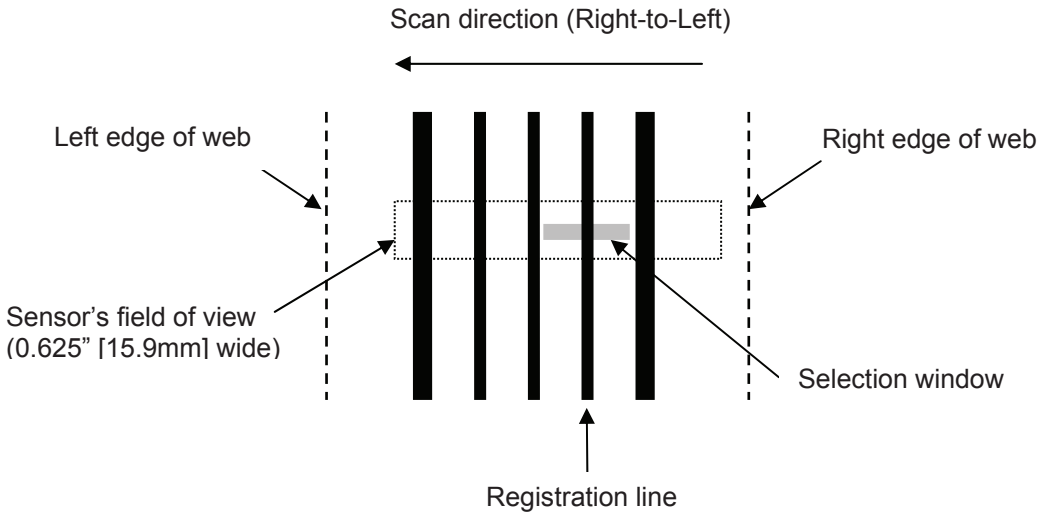
5) As you adjust the selection window size and position, the sensor will continuously analyze your selection and pick the best parameter settings to track the line or edge you selected. If it can reliably track this feature it will place an indicator dot directly under it in the display.
6) If the indicator dot is not visible or is in the wrong place, adjust the selection window size and position until the indicator appears under the desired line or edge.

> **Tip:** To exit from the auto-calibration procedure without changing any settings, press the UP key repeatedly until the “Exit?” message appears, then press ENTER.

7) When the indicator dot is under the line or edge you want to track, press the ENTER key to complete the auto-calibration.

Example # 1 - Tracking a line:

1) Suppose you have a series of dark lines printed on white paper, as shown below. The wide lines are 0.050" [1.3mm] wide, the narrow lines are 0.025" [0.6mm] wide, and the lanes between the lines are 0.100" [2.5mm] wide:



2) Now, let's assume you want to track the narrow line closest to the right edge of the web. Since there will probably be several lines in the sensor's field of view you will need to indicate which line you want the sensor to track.

   a) Position the sensor so that it is approximately centered over the registration line.

   b) Select the Calibration parameter and press ENTER to start the auto-calibration procedure.

   c) When the "Select line/edge" message appears, adjust the position and width of the selection window so that it straddles the registration line and as much of the white area around it as possible. Make sure the window *does not* touch the other lines nearby. Use the DOWN key to adjust position and the UP key to adjust size.

   Note: It may not be necessary to adjust the selection window if there is only one line in the sensor's field of view and the sensor has been centered over it.

   d) As you adjust the window size and position, the sensor will continuously analyze your selection and pick the best parameter settings to track the line you selected. If it can reliably track this line it will place an indicator dot directly under it.

   e) If the indicator dot is not visible or is in the wrong place, adjust the selection window size and position until the indicator appears under the desired line.

   Tip: To exit from the auto-calibration procedure without changing any settings, press the UP key repeatedly until the "Exit?" message appears, then press ENTER.

   Tip: To track lines that vary greatly in width, press the UP key repeatedly until you see the selection widow double in thickness. This mode widens the Min/Max parameter tolerances to ± 50%. These parameters are described below.

3) When the indicator dot is under the line you want to track, press the ENTER key to complete the auto-calibration. The sensor will then store the new parameter values in the current Job

Profile's memory. For the material used in this example the parameters will be set to the following values:

a) *Pattern* is set to Lt-Dk-Lt (Light-Dark-Light) because the registration line is darker than the surrounding background.

b) *Scan Direction* is set to R-to-L (Right-to-Left) so that the sensor will evaluate objects in its field of view beginning with those on the far right. As it scans from right to left, the first line it encounters that satisfies the Min/Max width rules (described in the next step) will be the narrow line closest to the right edge of the web – the line we want to track.

c) *Max Center* is set to 12 and *Min Center* is set to 9. These parameters define the maximum and minimum acceptable widths of the registration line. To accommodate some variation in line width the *Max Center* value is set 12.5% larger than the nominal width and the *Min Center* value is set 12.5% smaller than the nominal width.

   Note: Refer to page 71 for more information about the Min/Max parameters.

   Note: The settings for the Min/Max parameters range from 0 to 127 and are scaled in units of "pixels", or 0.0049" [0.124 mm].

d) *Min Left* and *Min Right* are both set to 36. These parameters define the minimum widths of the white areas covered by the selection window adjacent to the registration line. To accommodate some variation in these widths they are both set 12.5% smaller than their nominal widths.

e) *Max Left* and *Max Right* are both set to 127. These parameters define the maximum widths of the white areas adjacent to the registration line. Setting them to 127 removes any restriction on the maximum width of these areas, so either one could extend beyond the edge of the sensor's field of view.

f) *LED Color* is set to Red. Auto-calibration will select the lighting color that produces the greatest contrast between the registration line and background. For black and white patterns (like the one in this example) any LED color will work well, but for colored lines and backgrounds there will often be one particular LED color that produces a significantly greater contrast.

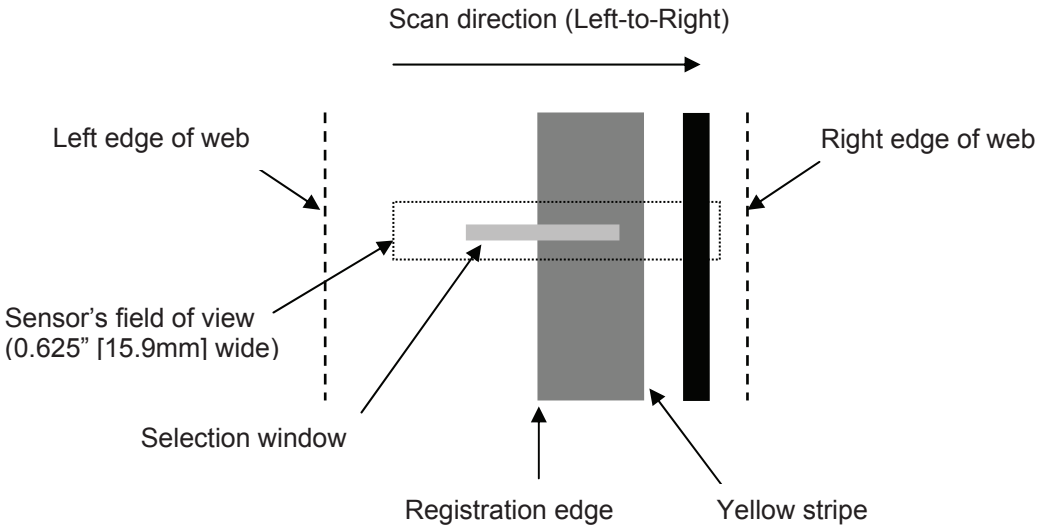
g) *LED Angle* is set to Diffuse. This lighting angle provides the best contrast between the registration line and background on dull, non-glossy materials like the one used in this example. To track a dark line printed on metallized film or to track the edge of glossy film material, the best angle would be Reflective. For certain holographic materials the Side setting may work best.

h) *Filter* is set to 4. This parameter helps the sensor ignore scratches, smudges, and other stray marks by deliberately blurring the image. Higher settings create more blurring, so the auto-calibration routine will select the highest setting that blurs the edges of the registration line without totally obscuring it. Generally, higher settings will be selected only for wider registration lines.

i) *Threshold* is set to 10 - a value that is approximately 50% of the contrast value of the registration line's edges. This will filter out other edges in the sensor's field of view that fall below this value.

Example # 2 - Tracking an edge:

1) Suppose you have a narrow black line and a wide yellow stripe printed on silver metallized film, as shown below:



2) Now, let's assume you want to track the left edge of the yellow stripe. Since there will probably be several edges in the sensor's field of view you will need to indicate which edge you want the sensor to track.

   a) Position the sensor so that it is approximately centered over the left edge of the yellow stripe.

   b) Select the Calibration parameter and press ENTER to start the auto-calibration procedure.

   c) When the "Select line/edge" message appears, adjust the position and width of the selection window so that it straddles the left edge of the yellow stripe and covers roughly equal amounts of the stripe and metallized area to its left. Make sure the window *does not* touch the right edge of the stripe. Use the DOWN key to adjust position and the UP key to adjust size.

   Note: It may not be necessary to adjust the selection window if there is only one edge in the sensor's field of view and the sensor has been centered over it.

   d) As you adjust the window size and position, the sensor will continuously analyze your selection and pick the best parameter settings to track the edge you selected. If it can reliably track this edge it will place an indicator dot directly under it.

   e) If the indicator dot is not visible or is in the wrong place, adjust the selection window size and position until the indicator appears under the desired edge.

   Tip: To exit from the auto-calibration procedure without changing any settings, press the UP key repeatedly until the "Exit?" message appears, then press ENTER.

3) When the indicator dot is under the edge you want to track, press the ENTER key to complete the auto-calibration. The sensor will then store the new parameter values in the current Job Profile's memory. For the material used in this example the parameters will be set to the following values:

a) *Pattern* is set to Lt-Dk (Light-Dark) because the metallized area to the left of the edge is lighter than the yellow stripe to the right of it.

b) *Scan Direction* is set to L-to-R (Left-to-Right) so that the sensor will evaluate objects in its field of view beginning with those on the far left. As it scans from left to right, the first edge it encounters that satisfies the Min/Max width rules (described in the next step) will be the left edge of the yellow stripe – the edge we want to track.

c) *Min Left* and *Min Right* are both set to 53. *Min Left* defines the minimum width of the metallized area to the left of the edge and *Min Right* defines the minimum width of the yellow stripe to the right of the edge. To accommodate some variation in these widths they are both set approximately 12.5% smaller than their nominal widths.

Note: Refer to page 71 for more information about the Min/Max parameters.

Note: The settings for the Min/Max parameters range from 0 to 127 and are scaled in units of “pixels”, or 0.0049” [0.124 mm].

d) *Max Left* and *Max Right* are both set to 127. These parameters define the maximum widths of the Left and Right areas described in the previous step. Setting them to 127 removes any restriction on the maximum width of these areas, so either one could extend beyond the edge of the sensor’s field of view.

e) *Max Center* and *Min Center* are set to their default values of 127 and 0, respectively. These parameters are not used for edge tracking.

f) *LED Color* is set to Blue. Auto-calibration will select the lighting color that produces the greatest contrast between the registration edge and background. For yellow markings (like those in this example) blue typically produces a significantly greater contrast than other lighting colors.

g) *LED Angle* is set to Reflective. This lighting angle provides the best contrast between the registration line and background on highly reflective or mirror-like materials like the one used in this example.

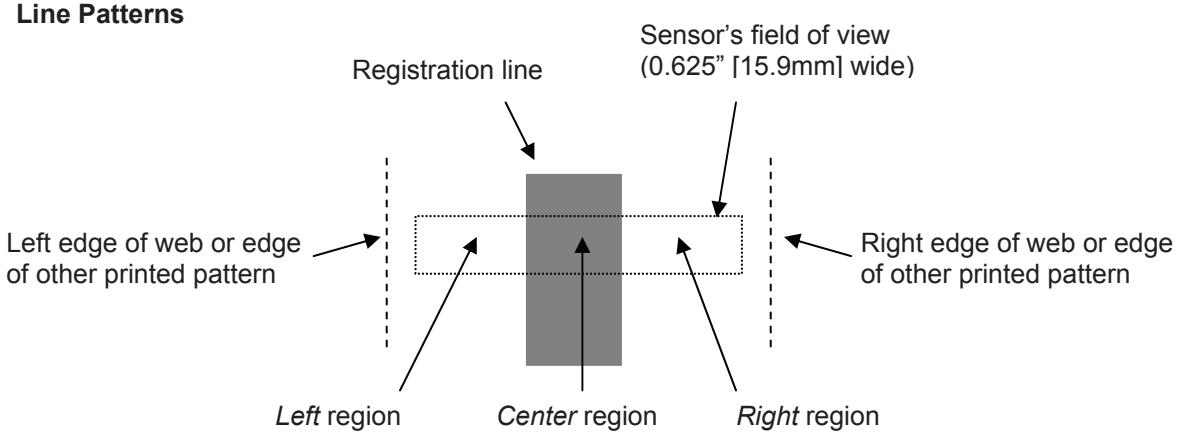
h) *Filter* is set to 16. This parameter helps the sensor ignore scratches, smudges, and other stray marks by deliberately blurring the image. Higher settings create more blurring, so the auto-calibration routine will select the highest setting that blurs the edge of the registration stripe without totally obscuring it. Generally, higher settings will be selected only for wider registration stripes.

i) *Threshold* is set to 12 - a value that is approximately 50% of the contrast value of the registration line’s edges. This will filter out other edges in the sensor’s field of view that fall below this value.

Min/Max Parameters - Glossary:

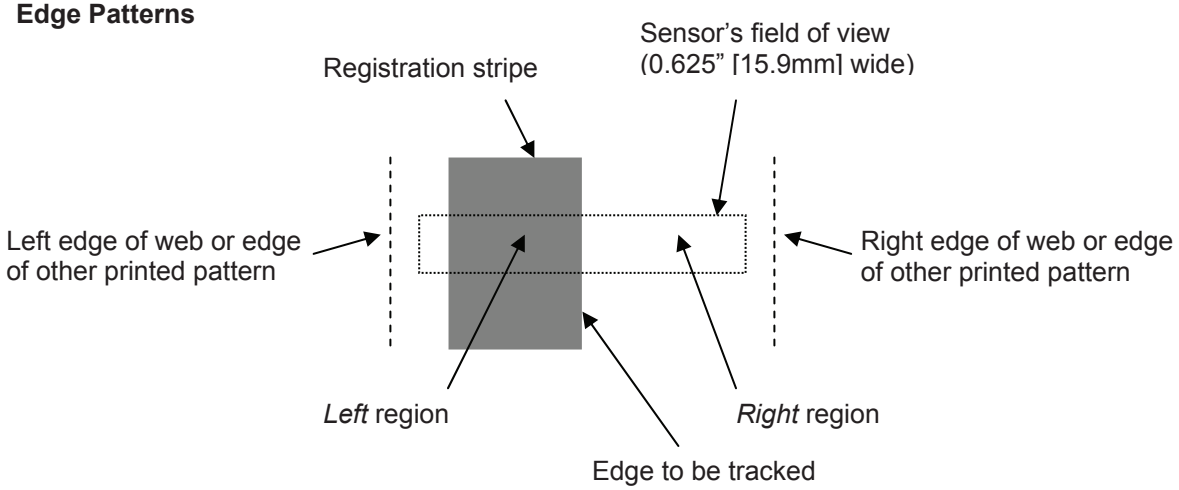
In order to understand the purpose and function of the Min/Max width parameters, it is necessary to define the various parts of standard Line and Edge patterns:

Line Patterns



Line patterns are defined by three regions. The *Left* region is the area located to the left of the registration line, the *Center* region is the registration line itself, and the *Right* region is the area located to the right of the registration line. By defining the size of these regions using the Min/Max Left, Min/Max Center, and Min/Max Right parameters, the sensor can be configured to track the center of the registration line and ignore any other printing within its field of view.

Edge Patterns



Edge patterns are defined by two regions. The *Left* region is the area located to the left of the edge to be tracked, and the *Right* region is the area located to the right of edge to be tracked. [**Note:** Edge patterns do not have a *Center* region.] By defining the size of these regions using the Min/Max Left and Min/Max Right parameters, the sensor can be configured to track the edge of the registration stripe and ignore any other printing within its field of view.

Parameters

The AccuBeam 3 Digital Line Guide can track lines and edges printed on many different types of materials. There are twelve tracking parameters that can be adjusted to configure the sensor for a particular pattern and background material. These parameters include: LED Color, LED Angle, Filter, Threshold, Pattern, Scan Direction, Min/Max Left, Min/Max Center, and Min/Max Right.

> **Tip:** The quickest and most reliable way to set the line and edge tracking parameters is to use the auto-calibration procedure (page 66). This procedure automatically finds the optimum values for all line and edge tracking parameters. These parameters can also be examined and manually set as described in the Operation section of this manual (page 64).

The Digital Line Guide can store up to 25 unique parameter configurations (called *job profiles*) that make material changeover faster and less error-prone. When a job profile is selected, all previously stored parameter settings for that job are instantly recalled.

The Digital Line Guide's parameters are described below:

Job Profile

Job Profile 1

Range: 1 to 25

The Digital Line Guide can store up to 25 unique parameter configurations (called *job profiles*) that make material changeover faster and less error-prone. When a job profile is selected, all previously stored parameter settings for that job are instantly recalled.

To save a new job profile, select an unused profile number, then change the other parameters as needed.

To modify an existing job profile, select its profile number, then change the other parameters as needed.

To recall a job profile, select the profile number.

Note: When AC power is turned on the system will automatically reload the job profile that was selected and in use when AC power was lost.

The default value is 1.

Offset

Offset 0.000

Range: ± 16.300”

The Offset parameter is typically used for setting the guide point position - when in Automatic mode the guide will maintain the web at this position. The offset is displayed in *inches*.

The default value is 0.000. After setting defaults this parameter will be hidden. Refer to the description of the Hidden parameter for more information about making this parameter visible.

Calibrate

Calibrate

This parameter initiates the auto-calibration procedure. This procedure automatically finds the optimum values for all line and edge tracking parameters. Complete instructions for using the auto-calibration procedure may be found on page 66.

LED Color (Tracking Parameter)

LED Color Blue

Range: Blue, Red, Green

This parameter selects the color of the light source. Select a color that maximizes the contrast between the line or edge and background material. This contrast value is displayed in the lower right corner of the display. **The default value is Blue.**

LED Angle (Tracking Parameter)

LED Angle Diff

Diffuse: Use this setting for materials with a dull, non-glossy finish. **This is the default value.**

LED Angle Refl

Reflective: Use this setting for highly reflective or glossy materials.

LED Angle Side

Side: Use this setting on holographic materials.

Filter (Tracking Parameter)

Filter 4

Range: 4, 8, or 16

This parameter helps the sensor ignore scratches, smudges, and other stray marks by deliberately blurring the image. Higher settings create more blurring, so should be selected only for wider registration lines or stripes. **The default value is 4.**

Threshold (Tracking Parameter)

Threshold 4

Range: 1 to 127

This parameter helps the sensor reject low-contrast or blurry edges. Any edge that has a contrast value lower than this threshold will be ignored by the sensor. **The default value is 4.**

Pattern **(Tracking Parameter)**

Pattern Lt-Dk-Lt	*Light-Dark-Light:* This setting will cause the sensor to track a dark line printed on a light background. **This is the default value.**
Pattern Dk-Lt-Dk	*Dark-Light-Dark:* This setting will cause the sensor to track a light line printed on a dark background.
Pattern Lt-Dk	*Light-Dark:* This setting will cause the sensor to track the *left* edge of a dark line or stripe printed on a light background, or the *right* edge of a light line or stripe printed on a dark background.
Pattern Dk-Lt	*Dark-Light:* This setting will cause the sensor to track the *right* edge of a dark line or stripe printed on a light background, or the *left* edge of a light line or stripe printed on a dark background.

Scan Direction **(Tracking Parameter)**

Scan Dir R-to-L	*Right-to-Left:* Scan the pattern from right to left. The sensor will evaluate objects in its field of view beginning with those on the far right. **This is the default value.**
Scan Dir L-to-R	*Left-to-Right:* Scan the pattern from left to right. The sensor will evaluate objects in its field of view beginning with those on the far left.

Maximum Left **(Tracking Parameter)**

Max Left 127	This parameter specifies the maximum acceptable width of the area located to the left of the registration line or edge. **The default value is 127.**

Range: 0 to 127 pixels

Note: A setting of 127 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Minimum Left **(Tracking Parameter)**

Min Left 0	This parameter specifies the minimum acceptable width of the area located to the left of the registration line or edge. **The default value is 0.**

Range: 0 to 127 pixels

Note: A setting of 0 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Maximum Center **(Tracking Parameter)**

Max Center 127

Range: 0 to 127 pixels

This parameter specifies the maximum acceptable width of the registration line. This parameter is not used when tracking an edge. **The default value is 127.**

Note: A setting of 127 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Minimum Center **(Tracking Parameter)**

Min Center 0

Range: 0 to 127 pixels

This parameter specifies the minimum acceptable width of the registration line. This parameter is not used when tracking an edge. **The default value is 0.**

Note: A setting of 0 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Maximum Right **(Tracking Parameter)**

Max Right 127

Range: 0 to 127 pixels

This parameter specifies the maximum acceptable width of the area located to the right of the registration line or edge. **The default value is 127.**

Note: A setting of 127 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Minimum Right **(Tracking Parameter)**

Min Right 0

Range: 0 to 127 pixels

This parameter specifies the minimum acceptable width of the area located to the right of the registration line or edge. **The default value is 0.**

Note: A setting of 0 *disables* this Min/Max rule.

Note: A “pixel” is equivalent to 0.0049” [0.124 mm].

Backlight

B	a	c	k	l	i	g	h	t						O	N

B	a	c	k	l	i	g	h	t					O	F	F

This parameter controls the LCD display backlight.

The default value is *on*.

Start-Up

S	t	a	r	t	-	U	p							1	8

Range: 0 to 18

This parameter determines which parameter will be displayed first when the Digital Line Guide is powered-up.

Refer to the table below for the numeric code that corresponds to each parameter.

The default value is 18 (Job Profile).

Parameter	Start-Up Value
Job Profile	18
Offset	17
Calibrate	16
LED Color	15
LED Angle	14
Filter	13
Threshold	12
Pattern	11
Scan Direction	10
Maximum Left	9
Minimum Left	8
Maximum Center	7
Minimum Center	6
Maximum Right	5
Minimum Right	4
Backlight	3
Hidden	2
Read-Only	1
Start-Up	0

Hidden

H	i	d	d	e	n					2	0	0	0	F

Range: 0 to FFFFF

This parameter can be configured to hide unused parameters. If a parameter is Hidden it cannot be selected or displayed.

The value of this parameter is a bit-field and is displayed in hexadecimal (hex) format. Each bit corresponds to a particular parameter – setting a bit to '1' hides the parameter, and setting it to '0' makes it visible. Refer to the tables on page 78 for bit definitions and hex conversion information.

To activate the Hidden feature the keypad must be Locked. If the keypad is Unlocked, then all parameters will be visible, regardless of the Hidden settings. Refer to page 79 for more information about this feature.

The default value is 2000F.

Example: The default value of 2000F (hex) corresponds to a bit-field pattern of 0010:0000:0000:0000:1111. This pattern hides the Offset, Backlight, Hidden, Read-Only, and Start-Up parameters.

Read-Only

R	e	a	d	-	O	n	l	y						0

Range: 0 to FFFFF

This parameter can be configured to prevent accidental or unauthorized changes to parameters. If a parameter is Read-Only it can be displayed but not changed.

The value of this parameter is a bit-field and is displayed in hexadecimal (hex) format. Each bit corresponds to a particular parameter – setting a bit to '1' makes the parameter read-only, and setting it to '0' makes it changeable. Refer to the tables on page 78 for bit definitions and hex conversion information.

To activate the Read-Only feature the keypad must be Locked. If the keypad is Unlocked, then all parameters can be changed, regardless of the Read-Only settings. Refer to page 79 for more information about this feature.

The default value is 0.

Example: The default value of 0 (hex) corresponds to a bit-field pattern of 0000:0000:0000:0000:0000. This pattern makes all parameters changeable.

Bit definitions:

		Job Profile	Offset	Calibrate	LED Color	LED Angle	Filter	Threshold	Pattern	Scan Direction	Maximum Left	Minimum Left	Maximum Center	Minimum Center	Maximum Right	Minimum Right	Backlight	Hidden	Read-Only	Start-Up
Bit number	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Hex digit	fifth				fourth				third				second				first			

Hexadecimal (hex) conversion:

Bit-field				Hex digit
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F

Example: Offset, Backlight, Hidden, Read-Only, and Start-up parameters are hidden

		Job Profile	Offset	Calibrate	LED Color	LED Angle	Filter	Threshold	Pattern	Scan Direction	Maximum Left	Minimum Left	Maximum Center	Minimum Center	Maximum Right	Minimum Right	Backlight	Hidden	Read-Only	Start-Up
Bit settings	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Hex digits	2				0				0				0				F			

Keypad Lock

The Digital Line Guide's keypad can be Locked or Unlocked to control access to the parameters. This feature is typically used to prevent accidental or unauthorized changes to stored values and to simplify the menu by hiding unused parameters.

When the keypad is Locked, the Hidden and Read-Only parameters are activated. The Hidden parameter hides unused parameters (if a parameter is Hidden it cannot be selected or displayed), and the Read-Only parameter prevents changes to parameters (if a parameter is Read-Only it can be displayed but not changed).

When the keypad is Unlocked all parameters are visible and all parameter values can be changed.

- To Lock the keypad, press and hold the DOWN key while cycling AC power to the attached controller.
- To Unlock the keypad, press and hold the UP key while cycling AC power to the attached controller.

Troubleshooting

The following checklist has been provided to assist in the analysis and repair of potential trouble situations with the Digital Line Guide. If a situation occurs that is not described in this list, contact AccuWeb for assistance.

Problem	Solution
The display does not display any characters.	Check item 1 in the table below.
The display is active but the keys do not work.	Check item 2 in the table below.
The system does not respond to parameter changes entered through the Digital Line Guide keypad.	Check item 1 in the table below.
The display shows “EEPROM error – Set defaults.”	Check item 3 in the table below.
The display shows “Serial i/o error.”	Check item 1 in the table below.
The sensor does not follow the line or edge.	Check item 4 in the table below.
The guide steers the web away from the sensor.	Check item 5 in the table below.

Item	Description / Repair Procedure
1	**Bad cable connection.** If the display is not working, check the interface cable and replace if bad.
2	**Keypad is disabled.** Refer to page 79 for more information about this feature.
3	**Non-volatile memory contains bad data.** Reset all parameters to their default values: To reset all parameters to their default values, press and hold the ENTER key while cycling AC power to the attached controller. When the power-up message appears release the ENTER key.
4	**Sensor in wrong position.** The Digital Line Guide must be mounted 1.00” [25.4mm] above the web surface, and its sight-point scribe marks must be aligned with the roll center-line as shown in the application drawing on page 139. The sensor should be positioned so that the line or edge to be guided is centered in its field of view when the guide is in Servo-Center mode.
5	**Sensor polarity is wrong.** The value of controller parameter 3, 4, or 50 must be changed for the selected sensor. Refer to page 17 for more information about setting controller parameters.

Maintenance

For best performance, clean the optical window on the underside of the unit if it becomes dusty or dirty. Use a clean, soft (non-abrasive) cloth dampened with a mild soap solution or a cleaning solution suitable for camera lenses.

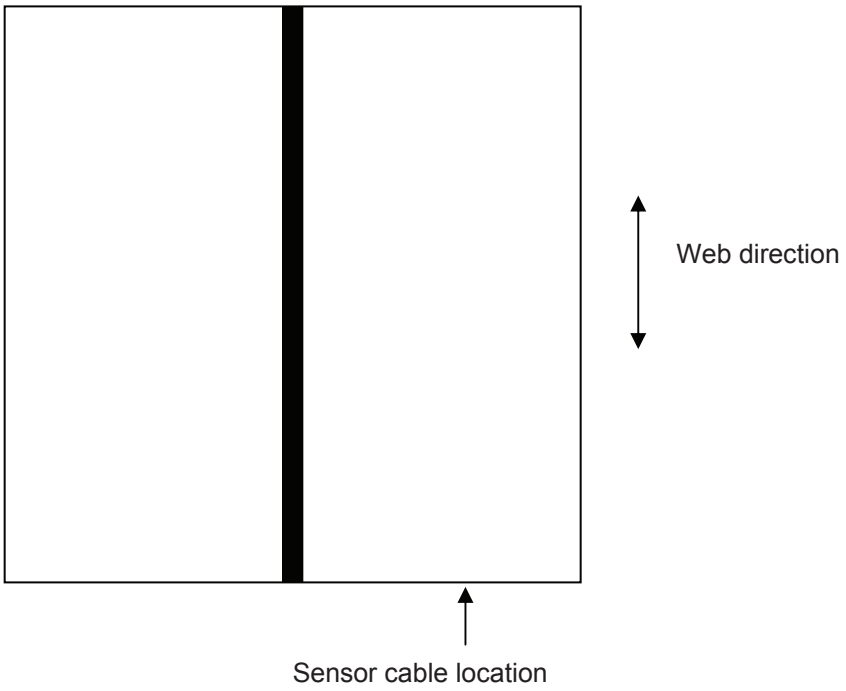
Appendix 1 / Parameter Summary

Parameter	Range	Default	Profile 1	Profile 2	Profile 3	Profile 4	Profile 5
Job Profile	1-25	1	1	2	3	4	5
Offset	± 16.300	0.000					
Calibrate							
LED Color	Blue Red Green	Blue					
LED Angle	Diff Refl Side	Diff					
Filter	4, 8, 16	4					
Threshold	1 to 127	4					
Pattern	Lt-Dk-Lt Dk-Lt-Dk Lt-Dk Dk-Lt	Lt-Dk-Lt					
Scan Dir	L-to-R R-to-L	L-to-R					
Max Left	0-127	127					
Min Left	0-127	0					
Max Center	0-127	127					
Min Center	0-127	0					
Max Right	0-127	127					
Min Right	0-127	0					
Backlight	Off On	On					
Hidden	0-FFFFF	2000F					
Read Only	0-FFFFF	0					
Start-Up	0-18	18					

Appendix 2 / Line Guide Test Pattern

Use this test pattern to verify the proper installation and operation of the Digital Line Guide:

Test pattern



AccuWeb® Linear Actuators

Introduction

AccuWeb linear actuators are available with a wide variety of motor technologies, power ratings, stroke lengths, and end-of-travel sensor options:

- Motor technologies include brush and brushless DC motors. Power ratings span the range of 20 to 746 watts (1.0 HP).
- Standard stroke lengths range from ± 1" to ± 6" [± 25mm to ± 152mm]. Other lengths are available upon request.
- End-of-travel options include limit switch or potentiometer feedback. Potentiometer feedback permits quick adjustment of end-of-travel and servo-center limits by setting controller parameters. All actuators have servo-center capability.

Setup

Actuators with limit switches (MM, MME, MN, MNE, and MX) actuators require no setup. Their end-of-travel limits are factory set.

Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT) may require some setup. They have adjustable end-of-travel limits and these may need to be changed in order to prevent mechanical jamming of the actuator or guide mechanism. Use the following table to set the initial values of the In Limit, Out Limit, and Servo-Center Position parameters. Refer to page 17 for more information about setting controller parameters.

Caution: To prevent mechanical jamming of the actuator do not set the end-of-travel limits beyond the range of values shown in the table. Also, make sure the limits conform to the following relationship:

In Limit ≤ Servo-Center Limit ≤ Out Limit

End-of-Travel Limits				
Actuator Model Number	**Stroke Range inches [mm]**	**In Limit (parameter 9)**	**Servo-Center (parameter 11)**	**Out Limit (parameter 10)**
MT-1	2.00 [50.8]	≥ 36	128	≤ 220
MT-2, SF-2	4.00 [101.6]	≥ 36	128	≤ 220
MT-4, SF-4	8.00 [203.2]	≥ 36	128	≤ 220
MT-6, SF-6	12.00 [304.8]	≥ 36	128	≤ 220
HL-3, HF-3	6.00 [152.4]	≥ 51	128	≤ 205
HL-6, HF-6	12.00 [304.8]	≥ 51	128	≤ 205
HT-4	8.00 [203.2]	≥ 67	128	≤ 189
HT-6	12.00 [304.8]	≥ 36	128	≤ 220
UHT-4	8.00 [203.2]	≥ 46	128	≤ 210
UHT-6	12.00 [304.8]	≥ 67	128	≤ 189
UHT-10	20.00 [508.0]	≥ 26	128	≤ 230
UHT-24	46.00 [1168.4]	≥ 10	128	≤ 246

Note: The In Limit and Out Limit values shown in the table for the UHT-24 actuator reduce its nominal range of motion from 48.00" [1219.2mm] to 46.00" [1168.4mm]. This prevents the mechanical jamming of this actuator.

Maintenance

Lubrication:

The only lubrication required for the linear actuator is the lead screw assembly. Lubricate the lead screw after every eighteen months of operation. Apply a small amount of white lithium grease to the lead screw.

Recommended Grease:

Lubriplate # 730-1 grease

Available from: Lubriplate Division
Fiske Brothers Refining Company
Newark, NJ 07105
or
Toledo, OH 43805

Note: If other than the recommended grease is used, the lead screw and nut MUST be thoroughly cleaned before applying the new grease. DO NOT mix greases.

Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT) - LUBRICATION:

1) Remove the actuator from the machine.
2) Extend the actuator to its Out end-of-travel limit.
3) Remove the three Allen nuts and end cap. Be careful not to damage the rubber seal.
4) Remove the barrel covering the lead screw.
5) Very lightly lubricate the lead screw with white lithium grease.

Caution: Do not over-lubricate the lead screw as this could bind the nut and lead screw.

6) Reassemble the actuator.
7) Retract and extend the actuator 20 times to distribute grease along the lead screw.
8) Reinstall the actuator and make sure the actuator shuts off before it reaches a mechanical stop.

Actuators with potentiometer feedback (MT, SF, HL, HF, HT, and UHT) – POTENTIOMETER REPLACEMENT:

If the position potentiometer has failed, replace the potentiometer with the following procedure:

1) Remove the actuator from the machine.
2) Remove the side covers from the drive box.
3) Manually position the actuator to the center of its stroke. Refer to the following table for the correct distance from the end of the drive tube to the end of the thrust tube.

Actuator Model	Servo-Center Length
MT-1	1 1/8" [28.6mm]
MT-2, SF-2	2 13/16" [71.4mm]
MT-4, SF-4	4 11/16" [119.1mm]
MT-6, SF-6	6 13/16" [173.0mm]
HL-3, HF-3	4 11/16" [119.1mm]
HL-6, HF-6	8 7/16" [214.3mm]
HT-4	4 7/8" [123.8mm]
HT-6	6 13/16" [173.0mm]
UHT-4	4 3/4" [120.7mm]
UHT-6	6 3/4" [171.5mm]
UHT-10	10 3/4" [273.1mm]
UHT-24	24 3/4” [628.7mm]

4) Loosen the attaching bolt and remove the potentiometer mounting bracket.
5) Remove the worm gear from the potentiometer shaft and remove the defective potentiometer from the mounting bracket.
6) Install a new potentiometer on the mounting bracket and connect the wiring to the same terminals of the new potentiometer as the old potentiometer.
7) Install the new potentiometer onto the mounting bracket and reinstall the worm gear on the potentiometer shaft.
8) Turn the potentiometer to its CW mechanical stop.
9) Rotate the potentiometer exactly five turns CCW.
10) Reinstall the mounting bracket into the drive box. Leave the mounting bolt loose.
11) Adjust the position of the mounting bracket so there is a small amount of backlash between the potentiometer worm and worm gear.
12) Tighten the mounting bolt.
13) Lubricate the worm and worm gear.
14) Reinstall the side covers on the actuator.
15) Press the SERVO-CENTER button and verify that the actuator drives to the correct position and stops. Refer to the previous table for the exposed length of the thrust tube.
16) Reinstall the actuator in the machine.

Actuators with limit switches (MM, MME, MN, and MNE) - LUBRICATION:

1) Remove the actuator from the machine.
2) Extend the actuator to its Out end-of-travel limit.
3) Remove the side covers or body extrusion by removing the hex-head screws.

> **Note:** For some models this may require removing the thrust tube rod end and end cap.

4) Very lightly lubricate the lead screw with white lithium grease.

> **Caution:** Do not over-lubricate the lead screw as this could bind the nut and lead screw.

5) Reassemble the actuator.
6) Retract and extend the actuator 20 times to distribute grease along the lead screw.
7) Reinstall the actuator and make sure the actuator shuts off before it reaches a mechanical stop.

Actuators with limit switches (MX) - LUBRICATION:

1) Press the MANUAL button, then press the OUT button to drive the actuator to its Out limit.
2) Remove the actuator from the positive displacement guide (PDG).
3) Gain access to the lead screw through the top of the actuator next to the cam follower and spacer. Very lightly lubricate the lead screw with white lithium grease.

> **Caution:** Do not over-lubricate the lead screw as this could bind the nut and lead screw.

4) Reassemble the actuator in the reverse order as disassembly.
5) Retract and extend the actuator 20 times to distribute grease along the lead screw.
6) Reinstall the actuator into the PDG and make sure the actuator shuts off before it reaches a mechanical stop.

Remote Station - Guide Point Adjust

Introduction

The Guide Point Adjust Remote Station provides a convenient method of adjusting the system's guide point from a remote location.

The Guide Point Adjust Remote Station is compatible with the following controllers:

MICRO 4000 NET or MICRO 1000 Controllers

The Guide Point Adjust Remote Station requires an interface cable to connect to these controllers. Cables are available in standard lengths of 12' [3.6m], 25' [7.6m], 50' [15.2 m], 75' [22.8m], and 100' [30.5m].

The Guide Point Adjust Remote Station also requires a Serial I/O board (AUX 4249) to connect to the MICRO 1000 Controller.

Product Specifications:

- Remote Station size (H x W x D): 2.52" [64mm] x 3.86" [98mm] x 1.41" [36mm]
- Power requirements: Supplied by controller
- Operating environment:

Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90%, Non-condensing

Installation

The Remote Station can be mounted in a variety of ways. The enclosure design allows the user to easily remove the rear housing for panel-mount applications. Refer to the application drawings and connection diagrams on page 139 for installation information.

Operation

This section describes the operation of the Remote Station front panel keys and display.

Display:

- The 2-line LCD display is divided into three fields as shown:

PARAMETER	VALUE
POSITION	

PARAMETER field: Name of the currently selected parameter.

VALUE field: Value of the currently selected parameter.

POSITION field: Current web position. This field is continuously updated.

- Dimensional values that indicate length, position or offset are displayed in *inches* or *millimeters*, depending on the setting of the Units parameter.
- The parameters are described in the Parameters section of this manual (page 92).
- At power-up, a software identification message is displayed for several seconds then the display reverts to the format described above:

	R	**e**	**m**	**o**	**t**	**e**		**S**	**t**	**a**	**t**	**i**	**o**	**n**	
	R	**M**	**T**	**0**	**3**		**G**	**P**	**x**	**x**	**.**	**x**	**x**		

Front panel keys:

- The front panel keys are defined as follows:

- To select a parameter press the ENTER key until the cursor is in the PARAMETER field, then press the UP or DOWN keys until the desired parameter is displayed.
- To change a parameter's value press the ENTER key until the cursor is in the VALUE field, then press the UP or DOWN keys until the desired value is displayed.
- Numeric values can be changed by increments of 0.001, 0.01, 0.1, or 1 inches (or 0.1, 1, 10, or 100 millimeters) by positioning the cursor on the corresponding digit in the VALUE field.
- The keys automatically repeat if held down for more than one second.

Parameters

This section provides a basic procedure for setting the Remote Station parameters and also describes each parameter in detail.

The Operation section of this manual (page 91) describes the operation of the Remote Station front panel keys and display.

Job Profile

Job Profile 1

Range: 1 to 25

The Remote Station can store up to 25 unique parameter configurations (called *job profiles*) that make material changeover faster and less error-prone. When a job profile is selected, all previously stored parameter settings for that job are instantly recalled.

To save a new job profile, select an unused profile number, then change the other parameters as needed.

To modify an existing job profile, select its profile number, then change the other parameters as needed.

To recall a job profile, select the profile number.

Note: When AC power is turned on the system will automatically reload the job profile that was selected and in use when AC power was lost.

The default value is 1.

Offset 1

Offset 1 0.000

Range: ± 16.300” [± 414.0 mm]

Offset 1 is typically used for setting the guide point position - when in Automatic mode the guide will maintain the web at this position. The offset is displayed in *inches* or *millimeters*.

The default value is 0.000.

Offset 2

Offset 2 0.000

Range: ± 16.300” [± 414.0 mm]

Offset 2 is typically used for setting a *second* guide point position in applications that require PLC control of guide point position. The controller’s AUXILIARY input determines which offset is active – Offset 1 or Offset 2. Refer to page 46 for more information about the AUXILIARY input. The offset is displayed in *inches* or *millimeters*.

The default value is 0.000.

Display Units

Units ENGLISH

Units METRIC

This parameter specifies the units of measurement for all dimensional values. In ENGLISH mode all dimensional values are displayed in *inches*. In METRIC mode all dimensional values are displayed in *millimeters*. The setpoint resolution in ENGLISH mode is 0.001 inch. The setpoint resolution in METRIC mode is 0.1 millimeter.

The default value is ENGLISH.

Backlight

Backlight ON

Backlight OFF

This parameter controls the LCD display backlight.

The default value is *on*.

Start-Up

Start-Up 6

Range: 0 to 7

This parameter determines which parameter will be displayed first when the Remote Station is powered-up.

Refer to the table below for the numeric code that corresponds to each parameter.

The default value is 6 (Offset 1).

Parameter	Start-Up Value
Job Profile	7
Offset 1	6
Offset 2	5
Units	4
Backlight	3
Hidden	2
Read-Only	1
Start-Up	0

Hidden

H	i	d	d	e	n								2	F

Range: 0 to FFFFF

This parameter can be configured to hide unused parameters. If a parameter is Hidden it cannot be selected or displayed.

The value of this parameter is a bit-field and is displayed in hexadecimal (hex) format. Each bit corresponds to a particular parameter – setting a bit to '1' hides the parameter, and setting it to '0' makes it visible. Refer to the tables on page 95 for bit definitions and hex conversion information.

To activate the Hidden feature the keypad must be Locked. If the keypad is Unlocked, then all parameters will be visible, regardless of the Hidden settings. Refer to page 96 for more information about this feature.

The default value is 2F.

Example: The default value of 2F (hex) corresponds to a bit-field pattern of 0000:0000:0000:0010:1111. This pattern hides the Offset 2, Backlight, Hidden, Read-Only, and Start-Up parameters.

Read-Only

R	e	a	d	-	O	n	l	y						0

Range: 0 to FFFFF

This parameter can be configured to prevent accidental or unauthorized changes to parameters. If a parameter is Read-Only it can be displayed but not changed.

The value of this parameter is a bit-field and is displayed in hexadecimal (hex) format. Each bit corresponds to a particular parameter – setting a bit to '1' makes the parameter read-only, and setting it to '0' makes it changeable. Refer to the tables on page 95 for bit definitions and hex conversion information.

To activate the Read-Only feature the keypad must be Locked. If the keypad is Unlocked, then all parameters can be changed, regardless of the Read-Only settings. Refer to page 96 for more information about this feature.

The default value is 0.

Example: The default value of 0 (hex) corresponds to a bit-field pattern of 0000:0000:0000:0000:0000. This pattern makes all parameters changeable.

Bit definitions:

	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	**Job Profile**	**Offset 1**	**Offset 2**	**Units**	**Backlight**	**Hidden**	**Read-Only**	**Start-Up**
Bit number	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Hex digit	fifth				fourth				third				second				first			

Hexadecimal (hex) conversion:

Bit-field				Hex digit
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F

Example: Offset 2, Backlight, Hidden, Read-Only, and Start-up parameters are hidden

	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	not used	**Job Profile**	**Offset 1**	**Offset 2**	**Units**	**Backlight**	**Hidden**	**Read-Only**	**Start-Up**
Bit settings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
Hex digits	0				0				0				2				F			

Keypad Lock

The Remote Station's keypad can be Locked or Unlocked to control access to the parameters. This feature is typically used to prevent accidental or unauthorized changes to stored values and to simplify the menu by hiding unused parameters.

When the keypad is Locked, the Hidden and Read-Only parameters are activated. The Hidden parameter hides unused parameters (if a parameter is Hidden it cannot be selected or displayed), and the Read-Only parameter prevents changes to parameters (if a parameter is Read-Only it can be displayed but not changed).

When the keypad is Unlocked all parameters are visible and all parameter values can be changed.

- To Lock the keypad, press and hold the DOWN key while cycling AC power to the attached controller.
- To Unlock the keypad, press and hold the UP key while cycling AC power to the attached controller.

Troubleshooting

The following checklist has been provided to assist in the analysis and repair of potential trouble situations with the Remote Station. If a situation occurs that is not described in this list, contact AccuWeb for assistance.

Problem	Solution
The display does not display any characters.	Check item 1 in the table below.
The display is active but the keys do not work.	Check item 2 in the table below.
The POSITION display does not respond to changes in web position.	Check item 1 in the table below.
The system does not respond to parameter changes entered through the Remote Station keypad.	Check item 1 in the table below.
The display shows “EEPROM error – Set defaults.”	Check item 3 in the table below.
The display shows “Serial i/o error.”	Check item 1 in the table below.

Item	Description / Repair Procedure
1	**Bad cable connection.** If the display is not working, check the interface cable and replace if bad.
2	**Keypad is disabled.** Refer to page 96 for more information about this feature.
3	**Non-volatile memory contains bad data.** Reset all parameters to their default values: To reset all parameters to their default values, press and hold the ENTER key while cycling AC power to the attached controller. When the power-up message appears release the ENTER key.

Remote Station - Auxiliary

Introduction

The Auxiliary Remote Station is intended for systems that require two Remote Stations. The other station must be either a Guide Point Adjust Remote Station or a Web Width Monitor Remote Station.

The Auxiliary Remote Station is also compatible with the Digital Line Guide and provides a convenient method of adjusting the Line Guide's parameters from a remote location.

The Auxiliary Remote Station is compatible with the following controllers, sensor, and remote stations:

MICRO 4000 NET or MICRO 1000 Controllers

The Auxiliary Remote Station requires an interface cable to connect to these controllers. Cables are available in standard lengths of 12' [3.6m], 25' [7.6m], 50' [15.2 m], 75' [22.8m], and 100' [30.5m].

The Auxiliary Remote Station also requires a Serial I/O board (AUX 4249) to connect to the MICRO 1000 Controller.

AccuBeam 3 Digital Line Guide Sensor

The Auxiliary Remote Station requires an interface cable and T-box assembly (CON 1000) to connect to the Digital Line Guide.

Guide Point Adjust Remote Station or Web Width Monitor Remote Station

The Auxiliary Remote Station requires an interface cable and T-box assembly (CON 1000) to connect to these remote stations.

Product Specifications:

- Remote Station size (H x W x D): 2.52" [64mm] x 3.86" [98mm] x 1.41" [36mm]
- Power requirements: Supplied by controller
- Operating environment:

Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90%, Non-condensing

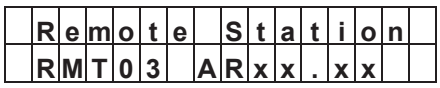
Installation

The Remote Station can be mounted in a variety of ways. The enclosure design allows the user to easily remove the rear housing for panel-mount applications. Refer to the application drawings and connection diagrams on page 139 for installation information.

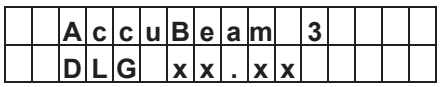
Operation

The Auxiliary Remote Station duplicates the front-panel display and keypad of the other installed remote station or digital line guide.

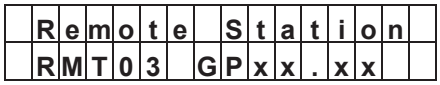
At power-up, a software identification message is displayed for several seconds:



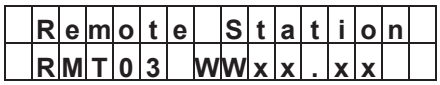
After a delay of several seconds, the Auxiliary Remote Station will then mirror the other remote station or digital line guide's display. Initially, this will be the other unit's power-up software identification message:



or



or



Keypad Lock

The Remote Station's keypad can be Locked or Unlocked to control access to the parameters. This feature is typically used to prevent accidental or unauthorized changes to stored values and to simplify the menu by hiding unused parameters.

When the keypad is Locked, the Hidden and Read-Only parameters are activated. The Hidden parameter hides unused parameters (if a parameter is Hidden it cannot be selected or displayed), and the Read-Only parameter prevents changes to parameters (if a parameter is Read-Only it can be displayed but not changed).

When the keypad is Unlocked all parameters are visible and all parameter values can be changed.

- To Lock the keypad, press and hold the DOWN key while cycling AC power to the attached controller.
- To Unlock the keypad, press and hold the UP key while cycling AC power to the attached controller.

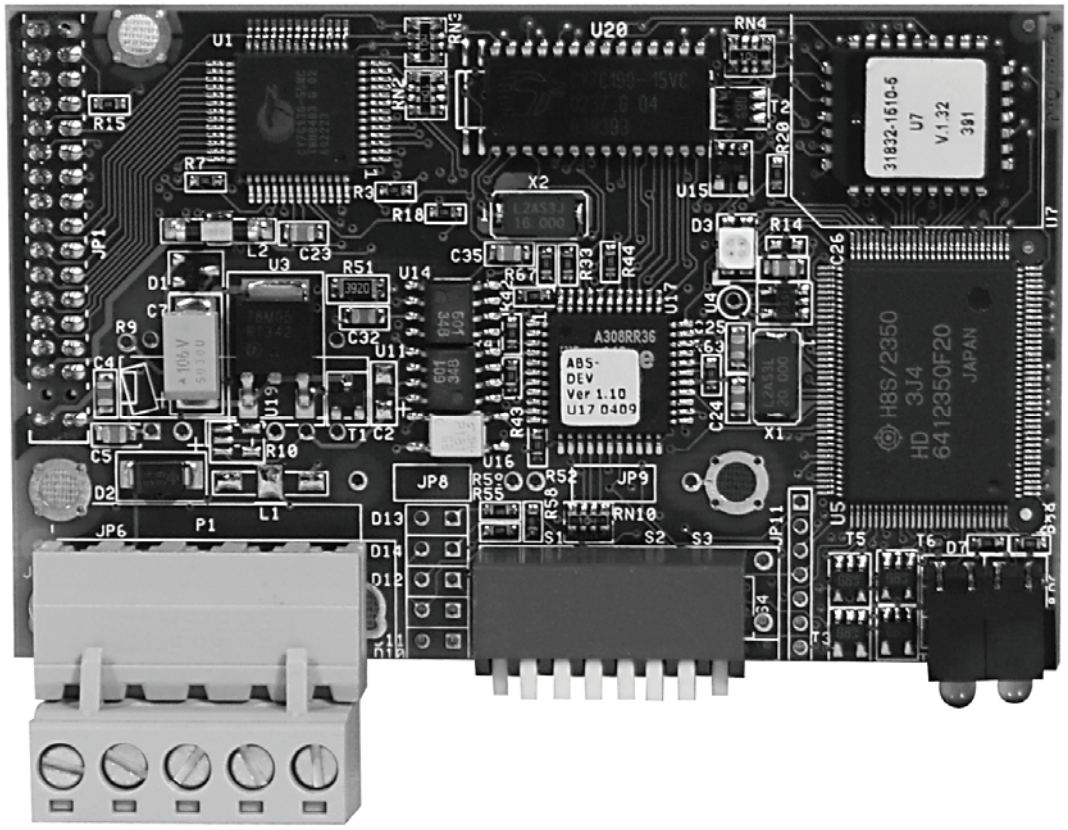
Troubleshooting

The following checklist has been provided to assist in the analysis and repair of potential trouble situations with the Remote Station. If a situation occurs that is not described in this list, contact AccuWeb for assistance.

Problem	Solution
The display does not display any characters.	Check item 1 in the table below.
The display is active but the keys do not work.	Check item 2 in the table below.
The display shows “EEPROM error – Set defaults.”	Check item 3 in the table below.
The display shows “Serial i/o error.”	Check items 1, 4 and 5 in the table below.

Item	Description / Repair Procedure
1	**Bad cable connection.** If the display is not working, check the interface cable and replace if bad.
2	**Keypad is disabled.** Refer to page 101 for more information about this feature.
3	**Non-volatile memory contains bad data.** Reset all parameters to their default values: To reset all parameters to their default values, press and hold the ENTER key while cycling AC power to the attached controller. When the power-up message appears release the ENTER key.
4	**Other remote station is malfunctioning**: Make sure that the other remote station is connected and operating properly. The non-volatile memory in the other remote station may need to be reset.
5	**Digital line guide is malfunctioning**: Make sure that the digital line guide is connected and operating properly. The non-volatile memory in the digital line guide may need to be reset.

Fieldbus Interface



Introduction

This document describes the installation and operation of the Fieldbus Interface card. This card permits a MICRO 4000 NET control system to communicate with a remote PLC or computer through a fieldbus network.

Interface cards are available for the most popular fieldbus protocols, including DeviceNet, Profibus, ControlNet, Modbus Plus, Modbus/TCP, and Ethernet TCP/IP.

The fieldbus interface provides full control of operating mode, guide point position, servo gain, and actuator speed limit; and permits monitoring of actuator position, end-of-travel status, and web position.

The fieldbus interface may be used in conjunction with other control inputs. These include the front-panel switchpad, discrete isolated inputs, and remote operator station. When receiving commands from multiple sources, the MICRO 4000 NET obeys the last command received.

The Fieldbus Interface card is compatible only with the MICRO 4000 NET Controller. It is not compatible with the MICRO 1000 Controller.

Installation

To install the fieldbus interface card in the MICRO 4000 NET controller, follow the steps below:

1. Field installation of the fieldbus interface card in the MICRO 4000 NET Controller:

f) Verify that the power source is *off* and locked out.

g) Install the fieldbus interface card by pushing it firmly onto header P2 on the MICRO 4000 NET controller assembly.

h) Secure the fieldbus interface card to the standoffs with three #4-40, 0.25” long machine screws and three #4 internal tooth star washers provided.

> **Note:** If the control system is ordered with the fieldbus interface card, these components will be factory installed and tested prior to shipment.

2. Connections and settings:

a) Install the fieldbus interface cable through an available cord grip.

b) Connect the interface cable to the plug for the fieldbus interface card. Configure the card with the correct network address and baud rate (if required).

c) Insert the plug back into its mating connector on the interface card.

i) Make sure the circuit board is free of metallic debris such as screws, lockwashers, and wire strands.

d) If any of the cables have been removed, shortened, or modified in any way, make sure the connections agree with the appropriate connection diagram.

Programming Information

The Fieldbus Interface card allows a PLC host to control the MICRO 4000 NET controller. The controller is configured by parameters described on page 17. Some of these parameters may be written by the host to change the system configuration or mode of operation, and all of the parameters may be read by the host to monitor the system status *(**Note:** This feature is limited in this version of software due to program memory constraints).*

Fieldbus terminology:

Fieldbus Master	The unit that controls the fieldbus network, typically a PLC or host computer. This controller sets the fieldbus addresses and determines how the slaves transmit information. There can only be one fieldbus master per network.
Fieldbus Slave	The unit that receives commands over the fieldbus network from the master. This unit responds to commands when requested by the master. There may be more than one fieldbus slave per network.
Data Direction	Output Array: Data packet sent from Fieldbus Master (host) to Fieldbus Slave (MICRO 4000 NET). Input Array: Data packet sent from Fieldbus Slave to Fieldbus Master.

The format of the data packets is described on the following pages.

Important: For proper operation of the Fieldbus Interface the MICRO 4000 NET controller must be configured for *momentary* inputs. Set parameter 27 (Power-Up Mode) to any value *except* 4. Refer to page 17 for more information about setting controller parameters.

Important: The configuration of the Operating Mode Command and Status bits depends on the setting of parameter 51 (Switchpad Type). Refer to page 17 for more information about setting controller parameters.

Note: In all tables, ***x*** indicates ***don't care*** or ***not used***.

Output Array data format - overview:

Output Array – data sent from host to MICRO 4000 NET										
Word	**Byte**	**Function**	**Bit**							
			7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Operating Mode Command	Auto	Servo Center	Manual	In	Out	Input A	Input B	Input C or Centerline
	1		not used						Auxiliary Input	Null Indicator
1	2	Guide Point Offset	Lower byte 0-255 [0-FFh]							
	3		Upper byte 0-255 [0-FFh]							
2	4	Servo Gain	Lower byte 0-40 [0-28h]							
	5		Upper byte 0							
3	6	Auto-Mode Speed Limit	Lower byte 0-120 [0-78h]							
	7		Upper byte 0							

Note: Upper and lower bytes of all Output Array words can be swapped by setting controller parameter 78 to 1. Refer to page 17 for more information about setting controller parameters.

Output Array data format – detailed description:

Output Array bytes 0 and 1 ***Operating Mode Command***					
Byte	**Bit**	**Function**	**Value**	**Switchpad Type (Param 51)**	**Action Performed**
0	7	Auto	1	0 or 1	No change.
				2	Select Automatic mode (guide the web using position feedback from sensors selected by the Input A, B, C, or Centerline command bits).
			0	x	No change.
	6	Servo Center	1	x	Select Servo-Center mode (move actuator to Servo-Center position).
			0	x	No change.
	5	Manual	1	x	Select Manual mode (stop actuator).
			0	x	No change.
	4	In	1	x	Select Manual mode and In mode (move actuator in).
			0	x	No change.
	3	Out	1	x	Select Manual mode and Out mode (move actuator out).
			0	x	No change.
	2	Input A	1	0	Select Input A and Automatic mode. **Note:** To select Centerline mode, set the Input A and B command bits to 0 and the Centerline command bit to 1.
				1	Select Input A and Automatic mode. **Note:** To select Centerline mode, set the Input A and B command bits to 1 and the Input C command bit to 0.
				2	Select Input A. **Note:** To select Centerline mode, set the Input A and B command bits to 1 and the Input C command bit to 0.
			0	x	No change.

Output Array bytes 0 and 1 *Operating Mode Command - continued*					
Byte	**Bit**	**Function**	**Value**	**Switchpad Type (Param 51)**	**Action Performed**
0	1	Input B	1	0	Select Input B and Automatic mode. **Note:** To select Centerline mode, set the Input A and B command bits to 0 and the Centerline command bit to 1.
				1	Select Input B and Automatic mode. **Note:** To select Centerline mode, set the Input A and B command bits to 1 and the Input C command bit to 0.
				2	Select Input B. **Note:** To select Centerline mode, set the Input A and B command bits to 1 and the Input C command bit to 0.
			0	x	No change.
	0	Input C or Centerline	1	0	Select Centerline mode and Automatic mode.
				1	Select Input C and Automatic mode.
				2	Select Input C.
			0	x	No change.

Output Array bytes 0 and 1 *Operating Mode Command - continued*					
Byte	**Bit**	**Function**	**Value**	**Switchpad Type (Param 51)**	**Action Performed**
1	7	not used	x	x	none
	6	not used	x	x	none
	5	not used	x	x	none
	4	not used	x	x	none
	3	not used	x	x	none
	2	not used	x	x	none
	1	Auxiliary Input	1	x	Activate the AUXILIARY input. This option is enabled by setting parameter 52. Refer to page 17 for more information about setting controller parameters.
			0	x	No change.
	0	Null Indicator	1	x	Use the *default* value of parameter 35 to control the switchpad and edge detector LEDs. Refer to page 17 for more information about setting controller parameters.
			0	x	Use the *current* value of parameter 35 to control the switchpad and edge detector LEDs. Refer to page 17 for more information about setting controller parameters.

The Operating Mode Command bits (output array) can be used alone or in parallel with the controller's switchpad and discrete isolated inputs to change the controller's operating mode. To change the operating mode, the fieldbus master should set the desired Operating Mode Command bit high. Once received, the controller will store the new operating mode in memory, then return an updated Operating Mode Status byte to the fieldbus master (input array). The fieldbus master should verify that the correct Operating Mode Status bit has changed, then complete the command by setting all Operating Mode Command bits low. Setting the bits low allows the controller to accept operating mode inputs from the switchpad and discrete isolated inputs.

Output Array bytes 2 and 3 *Guide Point Offset*		
Byte	**Value**	**Action Performed**
2	Low byte 0-255 [0-FFh]	Sets the guide point to the position indicated by this 16-bit value. Refer to Table 1 on page 115 for the range of allowed values.
3	High byte 0-255 [0-FFh]	

Output Array bytes 4 and 5 *Servo Gain*		
Byte	**Value**	**Action Performed**
4	0-40 [0-28h]	Sets parameter 5 (Servo Gain) to this 8-bit value. To use this feature, parameter 48 (Servo Gain and Speed Limit Source) must be set to 1. Refer to page 17 for more information about setting controller parameters.
5	0	

Output Array bytes 6 and 7 *Auto-Mode Speed Limit*		
Byte	**Value**	**Action Performed**
6	0-120 [0-78h]	Sets parameter 7 (Auto-Mode Speed Limit) to this 8-bit value. To use this feature parameter 48 (Servo Gain and Speed Limit Source) must be set to 1. Refer to page 17 for more information about setting controller parameters.
7	0	

Input Array data format – overview:

Input Array – data sent from MICRO 4000 NET to host										
Word	**Byte**	**Function**	**Bit**							
			7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Actuator Status	In Limit	Out Limit	Servo Center	x	No Fault	x	x	x
	1	Operating Mode Status	Auto	Servo Center	Manual	In	Out	Input A	Input B	Input C or Centerline
1	2	Actuator Position	Lower byte 0-255 [0-FFh]							
	3		Upper byte 0-255 [0-FFh]							
2	4	Edge A Position	Lower byte 0-255 [0-FFh]							
	5		Upper byte 0-255 [0-FFh]							
3	6	Edge B Position	Lower byte 0-255 [0-FFh]							
	7		Upper byte 0-255 [0-FFh]							

Note: Upper and lower bytes of all Input Array words can be swapped by setting controller parameter 78 to 1. Refer to page 17 for more information about setting controller parameters.

Input Array data format – detailed description:

Input Array byte 0	***Actuator Status***		
Bit	**Function**	**Value**	**Status Indicated**
7	In Limit	1	The actuator has retracted to the In limit position.
		0	The actuator is not at the In limit position.
6	Out Limit	1	The actuator has extended to the Out limit position.
		0	The actuator is not at the Out limit position.
5	Servo Center	1	The actuator has reached the Servo-Center position.
		0	The actuator is not at the Servo-Center position.
4	not used	x	none
3	No Fault	1	The controller is operating correctly. There are no operating faults.
		0	The controller is not operating correctly. Check the flashing '99' error code on the controller's parameter-entry display. Refer to page 42 for more information about error codes. ***or*** An edge-loss or line-loss condition has occurred. This option is enabled by setting parameter 47. Refer to page 17 for more information about setting controller parameters.
2	not used	x	none
1	not used	x	none
0	not used	x	none

Input Array byte 1	***Operating Mode Status***		
Bit	**Function**	**Value**	**Status Indicated**
7	Auto	1	*Parameter 51 (Switchpad Type) is set to 0 or 1:* Not defined. *Parameter 51 (Switchpad Type) is set to 2:* The unit is in Automatic mode.
		0	This mode not selected.
6	Servo Center	1	The unit is in Servo-Center mode.
		0	This mode not selected.
5	Manual	1	The unit is in Manual mode.
		0	This mode not selected.
4	In	1	The unit is in Manual mode and the In command is active.
		0	This mode not selected.
3	Out	1	The unit is in Manual mode and the Out command is active.
		0	This mode not selected.
2	Input A	1	*Parameter 51 (Switchpad Type) is set to 0 or 1:* Input A is selected and the unit is in Automatic mode. *Parameter 51 (Switchpad Type) is set to 2:* Input A is selected. **Note:** If the Input A and B status bits are both set to 1, then the unit is in Centerline mode.
		0	This mode not selected.
1	Input B	1	*Parameter 51 (Switchpad Type) is set to 0 or 1:* Input B is selected and the unit is in Automatic mode. *Parameter 51 (Switchpad Type) is set to 2:* Input B is selected. **Note:** If the Input A and B status bits are both set to 1, then the unit is in Centerline mode.
		0	This mode not selected.

Input Array byte 1 *Operating Mode Status – continued*			
Bit	**Function**	**Value**	**Status Indicated**
0	Input C or Centerline	1	*Parameter 51 (Switchpad Type) is set to 0:* Centerline mode is selected and the unit is in Automatic mode. *Parameter 51 (Switchpad Type) is set to 1:* Input C is selected and the unit is in Automatic mode. *Parameter 51 (Switchpad Type) is set to 2:* Input C is selected.
		0	This mode not selected.

Input Array bytes 2 and 3 *Actuator Position*		
Byte	**Value**	**Status Indicated**
2	Low byte 0-255 [0-FFh]	This 16-bit value indicates the current actuator position. Refer to Table 2 on page 116 for the range of allowed values.
3	High byte 0-255 [0-FFh]	

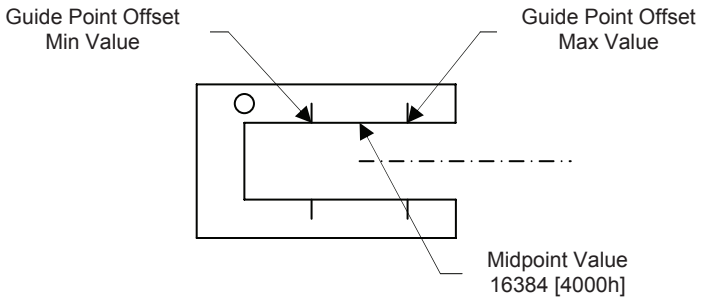
Input Array bytes 4 and 5 *Edge A Position*		
Byte	**Value**	**Status Indicated**
4	Low byte 0-255 [0-FFh]	This 16-bit value indicates the current position of the web in sensor A. Refer to Table 1 on page 115 for the range of allowed values.
5	High byte 0-255 [0-FFh]	

Input Array bytes 6 and 7 *Edge B Position*		
Byte	**Value**	**Status Indicated**
6	Low byte 0-255 [0-FFh]	This 16-bit value indicates the current position of the web in sensor B. Refer to Table 1 on page 115 for the range of allowed values.
7	High byte 0-255 [0-FFh]	

Table 1: Guide Point Offset and Web Position ranges							
Sensor Type	Sensor Model Number	Guide Point Offset			Web Position		
		Range inches [mm]	Min Value decimal	Max Value decimal	Range inches [mm]	Min Value decimal	Max Value decimal
PointSource Ultrasonic E/D	1.5x3U 4043-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	3x3U 4050-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	4x6U 4060-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	4x12U 4090-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
Ultrasonic WideArray E/D	1.5x3.75U 4612-XX	1.200 [30.48]	15784 [3DA8]	16984 [4258]	1.400 [35.56]	15684 [3D44]	17084 [42BC]
	4x3.75U 4621-XX	1.200 [30.48]	15784 [3DA8]	16984 [4258]	1.400 [35.56]	15684 [3D44]	17084 [42BC]
	1.5x5U 4511-XX	2.400 [60.96]	15184 [3B50]	17584 [44B0]	2.600 [66.04]	15084 [3AEC]	17684 [4514]
	4x5U 4500-XX	2.400 [60.96]	15184 [3B50]	17584 [44B0]	2.600 [66.04]	15084 [3AEC]	17684 [4514]
	1.5x9U 4524-XX	6.400 [162.56]	13184 [3380]	19584 [4C80]	6.600 [167.64]	13084 [331C]	19684 [4CE4]
	4x9U 4520-XX	6.400 [162.56]	13184 [3380]	19584 [4C80]	6.600 [167.64]	13084 [331C]	19684 [4CE4]
	4x14U 4530-XX	11.200 [284.48]	10784 [2A20]	21984 [55E0]	11.400 [289.56]	10684 [29BC]	22084 [5644]
	4x21U 4540-XX	18.400 [467.36]	7184 [1C10]	25584 [63F0]	18.600 [472.44]	7084 [1BAC]	25684 [6454]
Hi-Temp Ultrasonic E/D	UT 4068-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
PointSource Infrared E/D	1.5x3L 4044-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	3x3L 4051-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	4x6L 4061-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
	4x12L 4091-XX	0.064 [1.63]	16352 [3FE0]	16416 [4020]	0.255 [6.48]	16256 [3F80]	16511 [407F]
Infrared WideArray E/D	1.5x3.75L 4611-XX	1.200 [30.48]	15784 [3DA8]	16984 [4258]	1.400 [35.56]	15684 [3D44]	17084 [42BC]
	4x3.75L 4620-XX	1.200 [30.48]	15784 [3DA8]	16984 [4258]	1.400 [35.56]	15684 [3D44]	17084 [42BC]
	1.5x5L 4512-XX	2.400 [60.96]	15184 [3B50]	17584 [44B0]	2.600 [66.04]	15084 [3AEC]	17684 [4514]
	4x5L 4501-XX	2.400 [60.96]	15184 [3B50]	17584 [44B0]	2.600 [66.04]	15084 [3AEC]	17684 [4514]
	1.5x9L 4523-XX	6.400 [162.56]	13184 [3380]	19584 [4C80]	6.600 [167.64]	13084 [331C]	19684 [4CE4]
	4x9L 4521-XX	6.400 [162.56]	13184 [3380]	19584 [4C80]	6.600 [167.64]	13084 [331C]	19684 [4CE4]

	1.5x14L 4534-XX	11.200 [284.48]	10784 [2A20]	21984 [55E0]	11.400 [289.56]	10684 [29BC]	22084 [5644]
	4x14L 4532-XX	11.200 [284.48]	10784 [2A20]	21984 [55E0]	11.400 [289.56]	10684 [29BC]	22084 [5644]
Digital Line Guide	P/E 5100-XX	0.426 [10.82]	16171 [3F2B]	16597 [40D5]	0.625 [15.88]	16071 [3EC7]	16696 [4138]

- The midpoint value for all sensors is 16384 [4000h].
- The Guide Point Offset columns indicate the minimum and maximum values that can be sent to the controller to move the guide point. The controller automatically limits any value that is outside this range (i.e. a value less than the minimum will be set to the minimum value, a value greater than the maximum will be set to the maximum value).



- The Web Position columns indicate the minimum and maximum values that can be received from the sensor. There are two (2) web position values transmitted – Edge A and Edge B. To calculate a web width, subtract each position value from 16384 [4000h], then add the resulting values to the physical distance between the sensors. The distance between sensors should be measured from the center of sensor A's sensing area to the center of sensor B's sensing area.
- The Digital Line Guide and PointSource edge detectors each have one scribe mark to indicate the center of their sensing areas. WideArray detectors have two scribe marks to indicate the boundaries of their sensing areas, and the center of their sensing areas is the point exactly half-way between the two scribe marks.

Table 2: End-of-Travel Limits and Position Scale Factor

Actuator Model Number	Range inches [mm]	In Limit decimal [hex]	Servo Center decimal [hex]	Out Limit decimal [hex]	Scale 10^{-3} inch / count [10^{-3} mm / count]
MT-1	2.00 [50.8]	≥ 573 [23D]	2048 [800]	≤ 3523 [DC3]	0.6782 [17.225]
MT-2, SF-2	4.00 [101.6]	≥ 573 [23D]	2048 [800]	≤ 3523 [DC3]	1.3563 [34.451]
MT-4, SF-4	8.00 [203.2]	≥ 573 [23D]	2048 [800]	≤ 3523 [DC3]	2.7127 [68.902]
MT-6, SF-6	12.00 [304.8]	≥ 573 [23D]	2048 [800]	≤ 3523 [DC3]	4.0690 [103.353]
HL-3, HF-3	6.00 [152.4]	≥ 819 [333]	2048 [800]	≤ 3277 [CCD]	2.4414 [62.012]
HL-6, HF-6	12.00 [304.8]	≥ 819 [333]	2048 [800]	≤ 3277 [CCD]	4.8828 [124.023]
HT-4	8.00 [203.2]	≥ 1065 [429]	2048 [800]	≤ 3031 [BD7]	4.0690 [103.353]
HT-6	12.00 [304.8]	≥ 573 [23D]	2048 [800]	≤ 3523 [DC3]	4.0690 [103.353]

UHT-4	8.00 [203.2]	≥ 737 [2E1]	2048 [800]	≤ 3359 [D1F]	3.0518 [77.515]
UHT-6	12.00 [304.8]	≥ 1065 [429]	2048 [800]	≤ 3031 [BD7]	6.1035 [155.029]
UHT-10	20.00 [508.0]	≥ 410 [19A]	2048 [800]	≤ 3686 [E66]	6.1035 [155.029]
UHT-24	46.00 [1168.4]	≥ 164 [A4]	2048 [800]	≤ 3932 [F5C]	12.2070 [310.059]

- The In Limit, Out Limit, and Servo Center values can be converted to inches or millimeters by multiplying by the Scale value.

Troubleshooting

The following checklist has been provided to assist in the analysis and repair of potential trouble situations with the fieldbus interface. If a situation occurs that is not described in this list, contact AccuWeb for assistance.

Problem	Solution
Host is not communicating with the device (DeviceNet)	Check items 1-6 and 10 in the table below.
Host is not communicating with the device (ControlNet)	Check items 1, 4, 7, and 10 in the table below.
Host is not communicating with the device (Modbus Plus)	Check items 1, 4, 8, 9, and 10 in the table below.

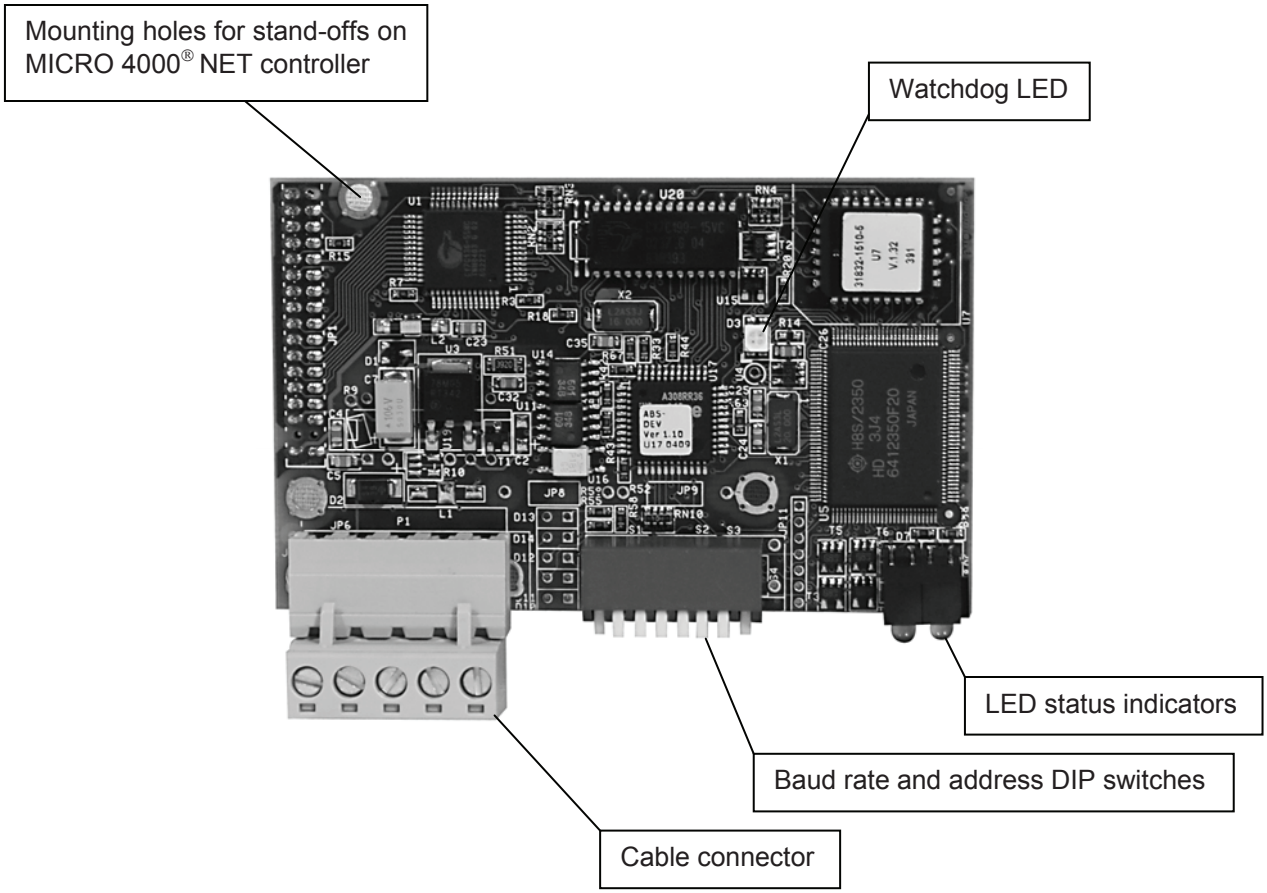
Item	Description / Repair Procedure
1	**Bad cable connection.** If the LED indicators are not working, check the interface cable and replace if bad.
2	**Missing terminating resistor.** Consult the Installation section of this manual (page 104) for more information on the terminating resistor.
3	**Missing 24 VDC power supply**. Check that supply power is present between terminals 1 and 5.
4	**Card has failed.** Check the watchdog LED indicator.
5	**Incorrect address setting.** DIP switch positions 3-8 must be set to the correct address for the node. Consult the Installation section of this manual (page 104) for more information on the address setting.
6	**Incorrect baud rate setting.** DIP switch positions 1 and 2 must be set to the correct baud rate for the network. Consult the Installation section of this manual (page 104) for more information on the baud rate setting.
7	**Incorrect address setting.** Rotary switch positions must be set to the correct address for the node. Consult the Installation section of this manual (page 104) for more information on the address setting.
8	**Incorrect address setting.** DIP switch S1 positions 1-6 must be set to the correct address for the node. Consult the Installation section of this manual (page 104) for more information on the address setting.
9	**Incorrect baud rate setting.** DIP switch S2 positions 1-6 must be set to the correct baud rate for the network. Consult the Installation section of this manual (page 104) for more information on the baud rate setting.
10	**Incorrect network configuration.** The **In** and **Out** data lengths set during initialization of the network must be equal to the lengths set during initialization of the fieldbus card.

Appendix 1 / DeviceNet Interface

Product Specifications:

- Card size (H x W x D): 3.38” [86mm] x 2.13” [54mm] x 0.59” [15mm]
- Power requirements: Supplied by DeviceNet controller (+24 VDC @ 70mA max.)
- Operating environment:

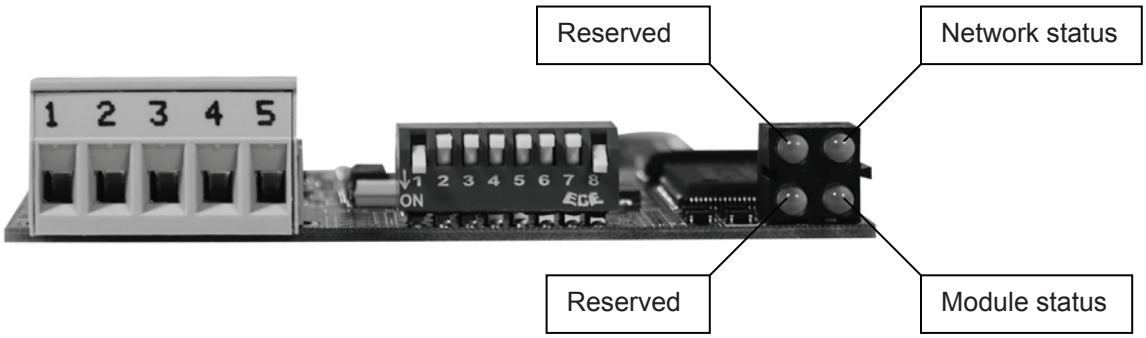
Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing


Mounting holes for stand-offs on MICRO 4000® NET controller
Watchdog LED
LED status indicators
Baud rate and address DIP switches
Cable connector

DeviceNet is a versatile, general-purpose fieldbus designed to satisfy the most common machine and cell-level wiring requirements. Devices can be powered from the network so wiring is minimized. The protocol is implemented on many different products from various manufacturers, from smart sensors to operator interfaces and AccuWeb web guides.

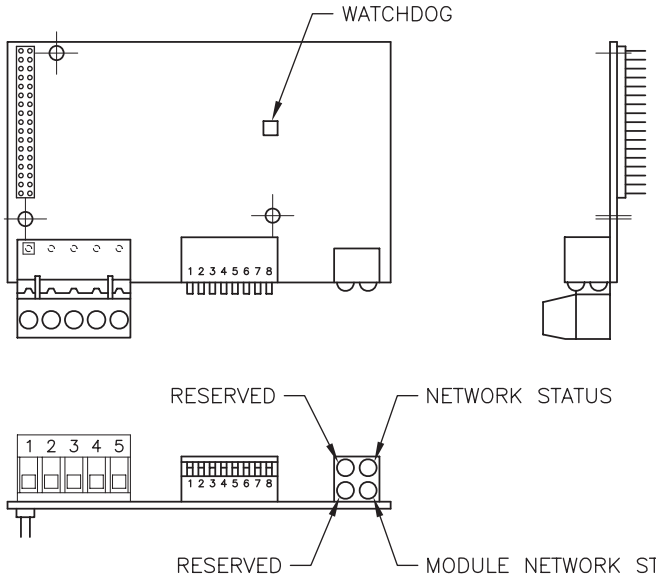
The media for the fieldbus is a shielded copper cable composed of one twisted pair and two wires for the external power supply. The baud rate can be changed between 125, 250, and 500 kbit/sec via a DIP switch on the DeviceNet interface card.

The module is equipped with four status LEDs mounted at the front of the card and one watchdog LED mounted in the middle of the card, used for debugging purposes. The function of the LEDs is described in the figure and tables below. Of the four status LEDs, two of them indicate network and module status, and the other two are reserved for future use.



Status LEDs	Description
Module status – steady off	No power
Module status – steady red	Unrecoverable fault
Module status – steady green	Device operational
Module status – flashing red	Minor fault
Network status – steady off	Not powered / not on-line
Network status – steady green	Link OK, on-line, connected
Network status – steady red	Critical link failure
Network status – steady flashing green	On-line, not connected
Network status – steady flashing red	Connection time-out

Watchdog LED	Color	Frequency
No firmware exists	Red	8Hz
Firmware downloading	Red/Green	1Hz
ROM check fault	Red	2Hz
Module not initialized	Green	2Hz
Module initialized and running OK	Green	1Hz
RAM check fault	Red	1Hz
DPRAM check fault	Red	4Hz

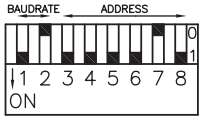


NOTES:

TERMINATING MODULE:
TERMINATION OF THE FIELDBUS REQUIRES A TERMINATING RESISTOR AT EACH END OF THE NETWORK. THESE RESISTORS SHOULD HAVE A VALUE OF 121 OHM.

ADDRESS SETTING:
THE DEVICENET MODULE ONLY SUPPORTS NODE ADDRESS AND BUAD RATE SETTING VIA THE DIP SWITCH ON THE MODULE. THE ADDRESS SETTING ON THE DIP SWITCH IS BINARY CODED WITH THE LSB TO THE RIGHT.

BAUD RATE:
THERE ARE THREE DIFFERENT BAUD RATES FOR DEVICENET; 125K, 250K, 500KBIT/S. CHOOSE ONE OF THEM BY SETTING THE DIP SWITCH BEFORE CONFIGURING.



A

BAUD RATE	SET DIP 1 2
125K	0 0
250K	0 1
500K	1 0
RESERVED	1 1

ADDRESS	SET DIP 3–8
0	0 0 0 0 0 0
1	0 0 0 0 0 1
2	0 0 0 0 1 0
.	.
.	.
61	1 1 1 1 0 1
62	1 1 1 1 1 0
63	1 1 1 1 1 1

DEVICENET CONNECTIONS			
PIN	SIGNAL	SYMBOL	WIRE COLOR
1	DATA GROUND	DGND	BLK
2	RECEIVE–/SEND DATA LOW	CAN–L	BLU
3	SHIELD	PE	SHD
4	RECEIVE /SEND DATA HIGH	CAN–H	WHT
5	+24V POWER SUPPLY	+V	RED

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
A	REVISED BAUD RATE DIP SWITCH SETTINGS.	2–11–00	DR	

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
FIELD BUS INTERFACE
DEVICE NET

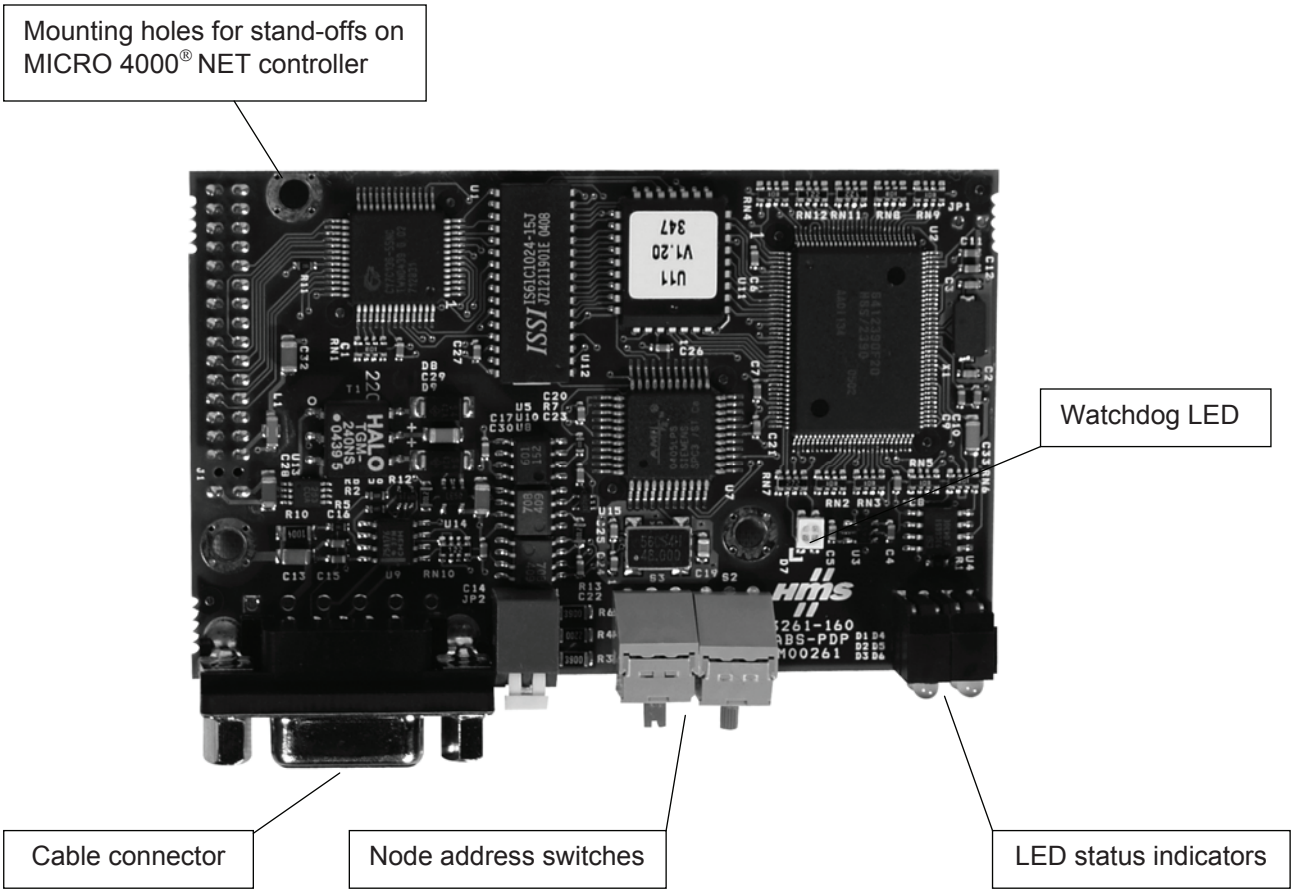
DWG. BY: DR	SCALE: N.T.S.	DWG. NO: EB–8555	REV: A
CKD. BY:	DATE: 8–25–99		

Appendix 2 / Profibus Interface

Product Specifications:

- Card size (H x W x D): 3.38” [86mm] x 2.13” [54mm] x 0.59” [15mm]
- Power requirements: None – provided by network
- Operating environment:

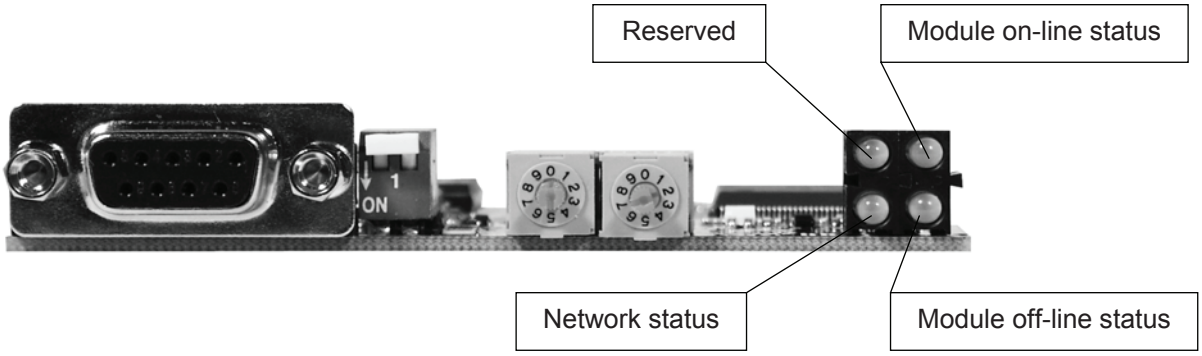
Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing



Profibus-DP is normally used in industrial automation to transfer fast data for motor controllers, HMIs, I/O units and other industrial equipment.

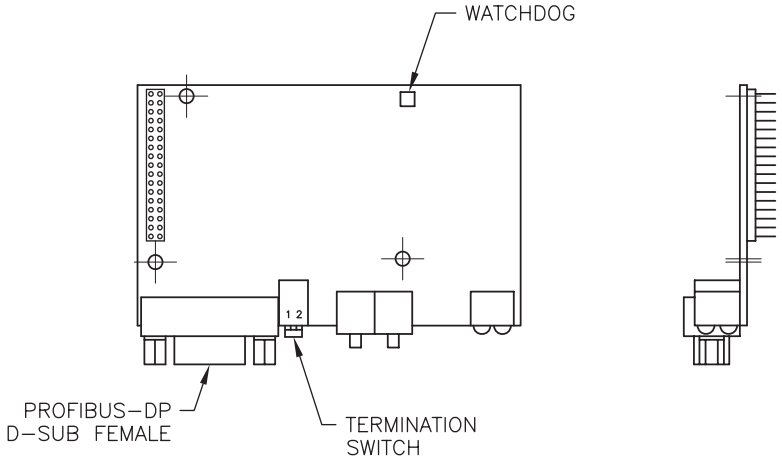
The media for Profibus-DP is a twisted pair copper cable. The baud rate for the bus is between 9.6 kbaud and 12 Mbaud. A Profibus-DP network can include up to 126 nodes, and the total amount of data allowed per module is 244 bytes in and 244 bytes out.

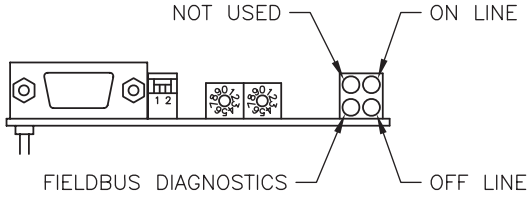
The module is equipped with four status LEDs mounted at the front of the card and one watchdog LED mounted in the middle of the card, used for debugging purposes. The function of the LEDs is described in the figure and tables below. Of the four status LEDs, one indicates network status, two indicate module status, and one is reserved for future use.



Status LEDs	Function
Network status – flashing red, 1 Hz	The **In** and/or **Out** length set during configuration of the module is not equal to the length set during configuration of the network
Network status – flashing red, 2 Hz	The length/contents of the User Parameter data set during configuration of the module is not equal to the length/contents set during configuration of the network
Network status – flashing red, 4 Hz	Error in configuration of the Profibus communication ASIC
Network status – off	No diagnostics present
Module on-line status – green	Module is on-line and data exchange is possible
Module on-line status – off	Module is not on-line
Module off-line status – red	Module is off-line and data exchange is not possible
Module off-line status - off	Module is not off-line

Watchdog LED	Color	Frequency
No firmware exists	Red	8Hz
Firmware downloading	Red/Green	1Hz
ROM check fault	Red	2Hz
Module not initialized	Green	2Hz
Module initialized and running OK	Green	1Hz
RAM check fault	Red	1Hz
DPRAM check fault	Red	4Hz



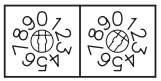


NOTES:

TERMINATING MODULE:
THE MODULE IS EQUIPPED WITH A 9 PIN D–SUB CONNECTOR FOR CONNECTION TO PROFIBUS–DP.

TERMINATION SWITCH:
THE MODULE IS EQUIPPED WITH A TERMINATION SWITCH. IF THE MODULE IS USED AS THE FIRST OR LAST MODULE IN A NETWORK THE TERMINATION SWITCH HAS TO BE IN THE ON POSITION. OTHERWISE THE SWITCH HAS TO BE IN THE OFF POSITION. IF AN EXTERNAL TERMINATION CONNECTOR IS USED THE SWITCH MUST BE IN THE OFF POSITION.

NODE ADDRESS SETTING:
THE NODE ADDRESS IS SET WITH TWO DECIMAL ROTARY SWITCHES AT THE FRONT. THE NODE ADDRESS CAN BE SET IN THE RANGE OF 1 – 99. THE SWITCHES SHALL NOT BE CHANGED DURING OPERATION. IF THEY ARE CHANGED A FAULT WILL BE DETECTED AND THE NODE ADDRESS WILL NOT BE UPDATED UNTIL THE NEXT POWER–UP.



ADDRESS	SET SWITCHES
1	0 1
2	0 2
3	0 3
.	.
.	.
97	9 7
98	9 8
99	9 9

D–SUB PIN	NAME
HOUSING	SHIELD
1	NOT CONNECTED
2	NOT CONNECTED
3	B–LINE
4	RTS*
5	GND BUS*
6	+5V BUS*
7	NOT CONNECTED
8	A–LINE
9	NOT CONNECTED

*+5V BUS AND GND BUS ARE USED FOR BUS TERMINATION. SOME DEVICES, LIKE OPTICAL TRANSCEIVERS (RS485 TO FIBER OPTICS) MIGHT REQUIRE EXTERNAL POWER SUPPLY FROM THESE PINS. RTS IS USED IN SOME EQUIPMENT TO DETERMINE THE DIRECTION OF TRANSMISSION.

IN NORMAL APPLICATIONS ONLY A–LINE, B–LINE AND SHIELD ARE USED.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
FIELD BUS INTERFACE
PROFIBUS

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

DWG. BY: DR	SCALE: N.T.S.	DWG. NO: EB–9041	REV:
CKD. BY:	DATE: 2–2–01		

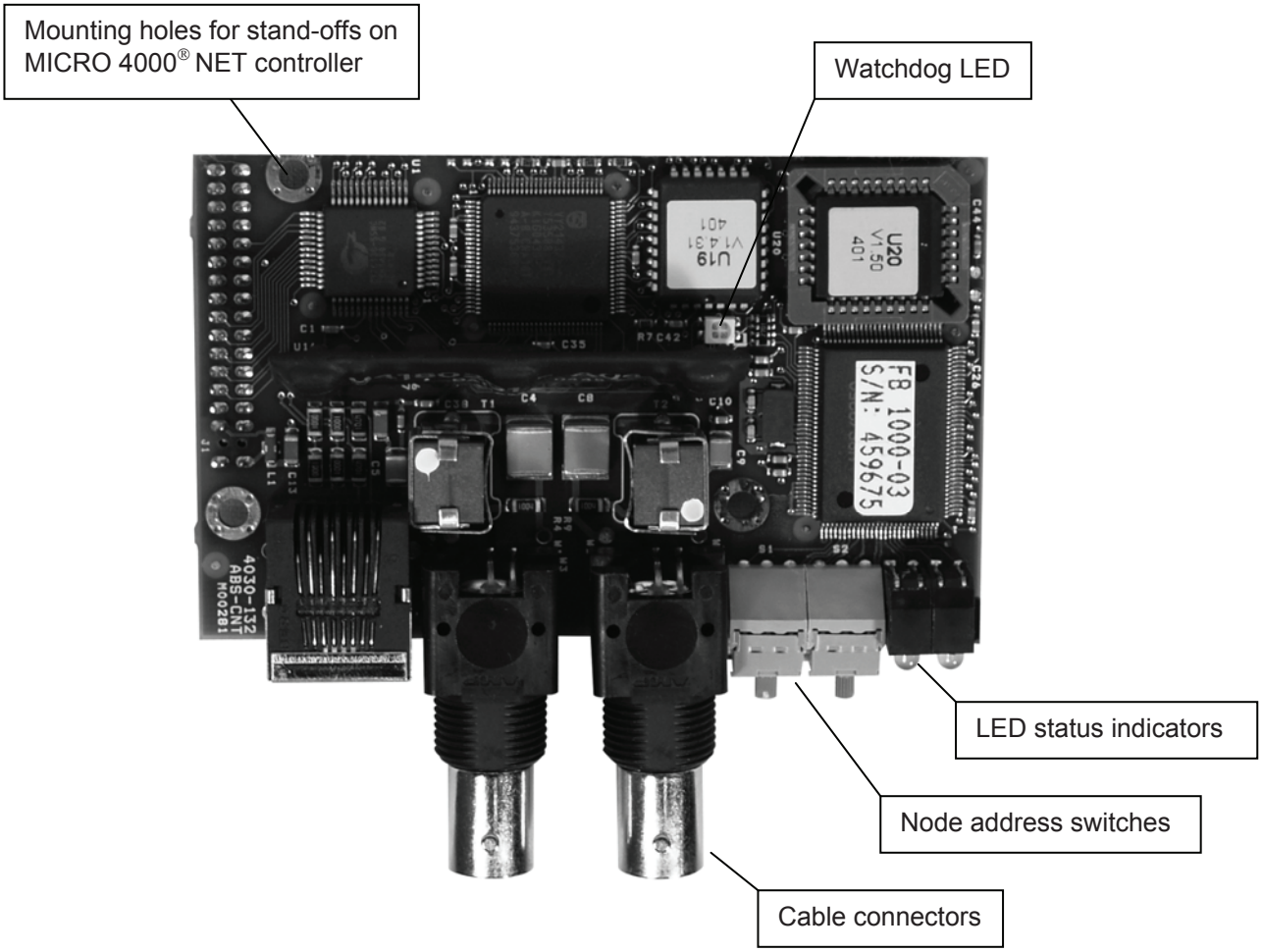
NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

Appendix 3 / ControlNet Interface

Product Specifications:

- Card size (H x W x D): 3.38” [86mm] x 2.13” [54mm] x 0.59” [15mm]
- Power requirements: None - provided by network
- Operating environment:

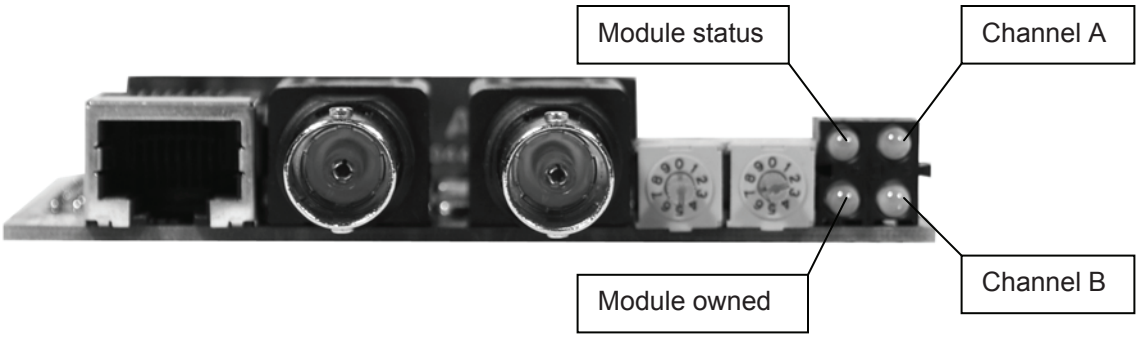
Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing



ControlNet is a real-time, control-layer network providing high-speed transmission of both time-critical I/O data and messaging data, including upload/download programming, configuration data and peer-to-peer messaging on a physical media link. ControlNet’s high-speed (5 Mbit/sec) control and data capabilities enhance I/O performance and peer-to-peer communication. ControlNet allows multiple controllers to control I/O on the same wires providing an advantage over other networks, which allow only one controller on the wire. ControlNet also allows multicast of both inputs and output peer data, thus reducing traffic on the wire and increasing system performance. ControlNet is deterministic and repeatable.

The media for the fieldbus is an RG-6 quad shielded cable or fiber with support for media redundancy. Flexibility in topology options (bus, tree, and star) meets various application needs.

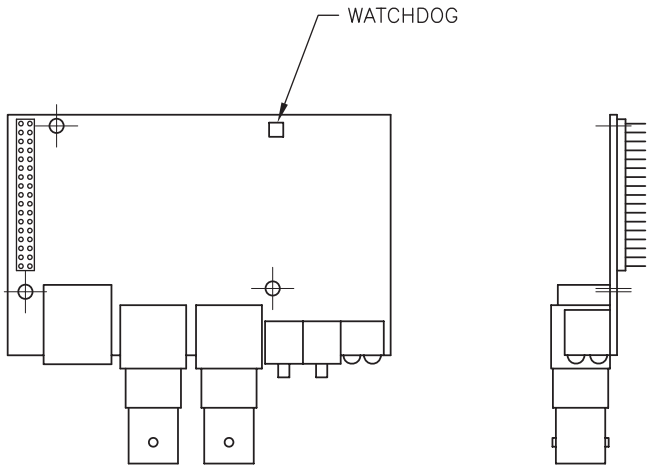
The module is equipped with four status LEDs mounted at the front of the card. The function of the LEDs is described in the figure and tables below. Of the four status LEDs, two of them indicate module status, and the other two indicate channel status.

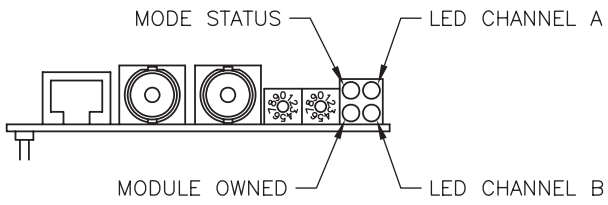


Channel LEDs	Description
A and B – steady off	Module is not initialized
A and B – steady red	Unrecoverable fault
A and B – alternating red/green	Self-test of bus controller
A and B – flashing red/off	Incorrect node configuration
A or B – steady off	Channel is disabled
A or B – steady green	Normal operation of channel
A or B – flashing green/off	Temporary error
A or B – flashing red/off	Media fault or no other nodes on network
A or B – alternating red/green	Incorrect network configuration

Module Status LED	Description
Flashing green	Module is waiting for initialization
Steady green	Module is initialized
Flashing red	Minor fault
Steady red	Major fault, module must be restarted

Module Owned LED	Description
Steady green	Connection is opened
Off	No connection is opened

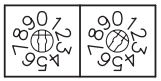




NOTES:

TERMINATING MODULE:
THE MODULE IS EQUIPPED WITH TWO BNC CONTACTS FOR CONNECTION TO CONTROL NET. IF REDUNDANT OPERATION IS DESIRED, BOTH CONNECTORS ARE USED, OTHERWISE CONNECTOR A OR B IS USED.
THE MODULE IS ALSO EQUIPPED WITH A NETWORK ACCESS PORT (NAP) FOR TEMPORARY CONNECTION OF CONFIGURATION TOOLS.

NODE ADDRESS SETTING:
THE NODE ADDRESS IS SET WITH TWO DECIMAL ROTARY SWITCHES AT THE FRONT. THE NODE ADRESS CAN BE SET IN THE RANGE OF 1 – 99. THE SWITCHES SHALL NOT BE CHANGED DURING OPERATION. IF THAY ARE CHANGED A FAULT WILL BE DETECTED AND THE NODE ADDRESS WILL NOT BE UPDATED UNTIL THE NEXT POWER–UP.



ADDRESS	SET SWITCHES
1	0 1
2	0 2
3	0 3
.	.
.	.
97	9 7
98	9 8
99	9 9

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
FIELD BUS INTERFACE
CONTROL NET

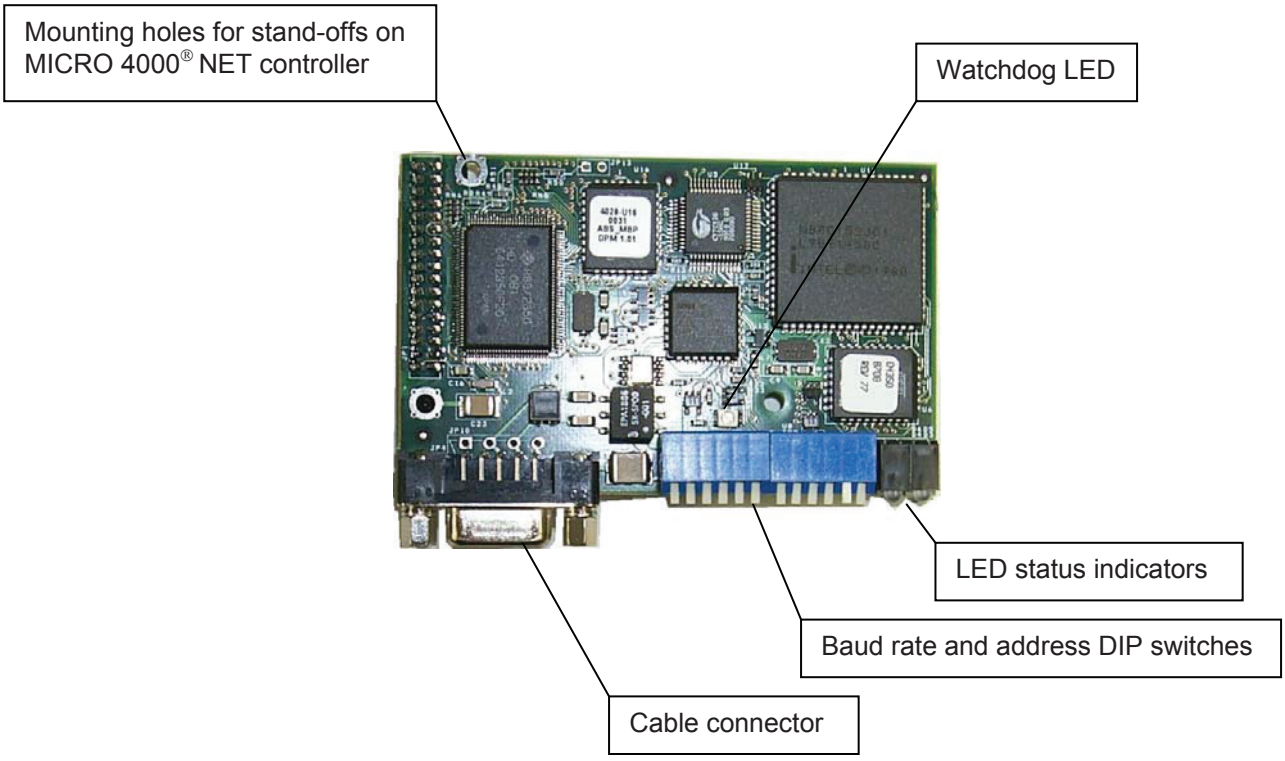
DWG. BY: DKR	SCALE: N.T.S.	DWG. NO: EB–8812	REV:
CKD. BY:	DATE: 3–15–00		

Appendix 4 / Modbus Plus Interface

Product Specifications:

- Card size (H x W x D): 3.38” [86mm] x 2.13” [54mm] x 0.59” [15mm]
- Power requirements: None – provided by network
- Operating environment:

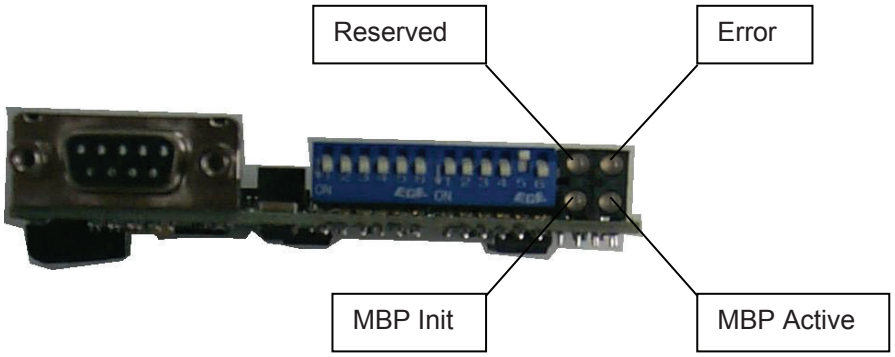
Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing


Mounting holes for stand-offs on MICRO 4000® NET controller
Watchdog LED
LED status indicators
Baud rate and address DIP switches
Cable connector

Modbus Plus is a local-area network system designed for industrial control and monitoring applications. The network enables programmable controllers, host computers, and other devices to communicate throughout plants and substations. The Modbus Plus module can communicate with all Modbus Plus nodes that comply with the Modbus Plus Protocol. The Modbus Plus module will not initiate any point-to-point communication with other nodes, it will only respond to incoming commands.

The media for the fieldbus is a shielded twisted pair cable. The data transfer rate is 1 Mbit/sec with a data throughput of 20,000 16-bit words per second.

The module is equipped with four status LEDs mounted at the front of the card and one watchdog LED mounted in the middle of the card, used for debugging purposes. The function of the LEDs is described in the figure and tables below. Of the four status LEDs, three of them indicate network and module status, and one is reserved for future use.



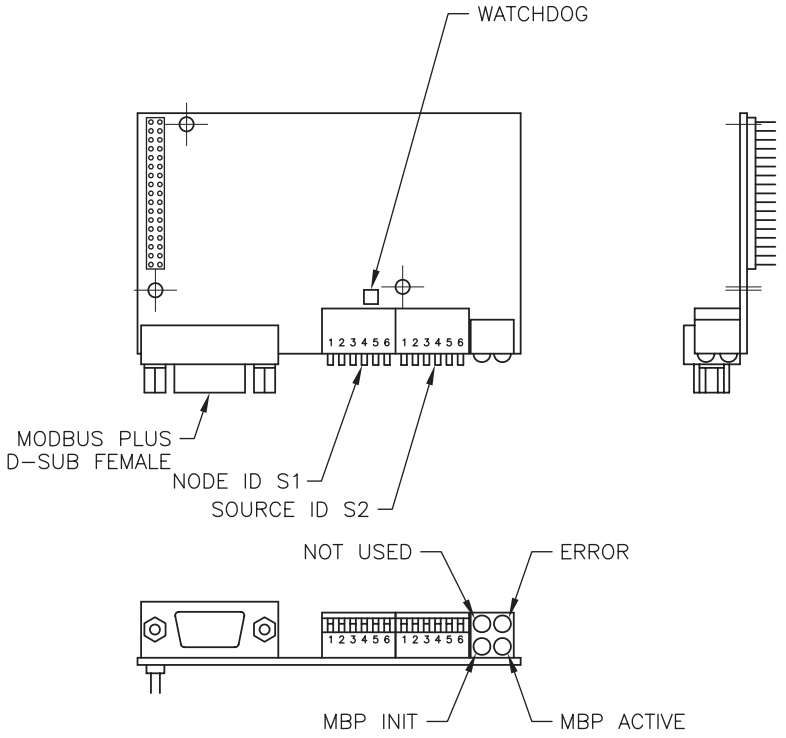
Status LEDs	Description
MBP Active – flash every 160 msec.	Device operational
MBP Active – flash every 1 sec.	In Monitor_Offline state
MBP Active – 2 flashes, off 2 sec.	In MAC_IDLE never-getting-token state
MBP Active – 3 flashes, off 1.7 sec.	Not hearing other nodes
MBP Active – 4 flashes, off 1.4 sec.	Duplicated node address detected on the network
Error – steady green	Link OK, on-line, connected
Error – steady red	Critical link failure
MBP Init – steady green	Connection initialized
MBP Init – steady red	Connection time-out

Watchdog LED	Color	Frequency
No firmware exists	Red	8Hz
Firmware downloading	Red/Green	1Hz
ROM check fault	Red	2Hz
Module not initialized	Green	2Hz
Module initialized and running OK	Green	1Hz
RAM check fault	Red	1Hz
DPRAM check fault	Red	4Hz

Modbus Plus Addressing:

When setting up the MSTR function, the read command (MICRO 4000 NET to Fieldbus Master (host)) must use register 40001 and the write command (Fieldbus Master (host) to MICRO 4000 NET) must use register 41025.

If the MICRO 4000 NET is located on a Modbus Plus network using a NOM module, do not forget to include the slot number on the NOM module along with the node address of the MICRO 4000 NET unit, in hex format, in the first routing path address.



D–SUB PIN	NAME
1	SHIELD
2	MBP LINE B
3	MBP LINE A
HOUSING	PE

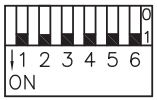
NOTES:

TERMINATING MODULE:
THE MODULE IS EQUIPPED WITH A 9 PIN D–SUB CONNECTOR FOR CONNECTION TO MODBUS PLUS.

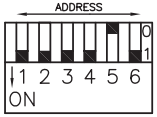
NODE ID (ADDRESS) S1:
THE NODE ID IS SET VIA THE DIP SWITCH S1 ON THE MODULE. THE ID SETTING ON THE DIP SWITCH IS BINARY CODED WITH THE LSB TO THE RIGHT. THE NODE ID CAN BE SET IN THE RANGE OF 1 – 64. THE SWITCHES SHOULD NOT BE CHANGED DURING OPERATION. ANY CHANGE OF THE NODE ID DURING POWER ON IS NOT VALID UNTIL THE NEXT POWER CYCLE.

SOURCE ID (ADDRESS) S2
THE MODBUS PLUS MODULE USES ONE NODE ADDRESS FROM 1– 64 TO CONFIGURE WHAT NODE WILL EXTRACT THE GLOBAL DATA FROM, SENT DURING THE TOKEN PASS. THE SETTING ON THE DIP SWITCH IS BINARY CODED WITH THE LSB TO THE RIGHT. THE SOURCE ADDRESS CANNOT BE CHANGED DURING OPERATION.

NODE ID S1



SOURCE ID S2



FUNCTION	SET DIP 1–6
NODE ADDRESS SET TO 1	1 1 1 1 1 1
NODE ADDRESS SET TO 2	1 1 1 1 1 0
NODE ADDRESS SET TO 3	1 1 1 1 0 1
.	.
.	.
NODE ADDRESS SET TO 63	0 0 0 0 0 1
NODE ADDRESS SET TO 64	0 0 0 0 0 0

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
FIELD BUS INTERFACE
MODBUS PLUS

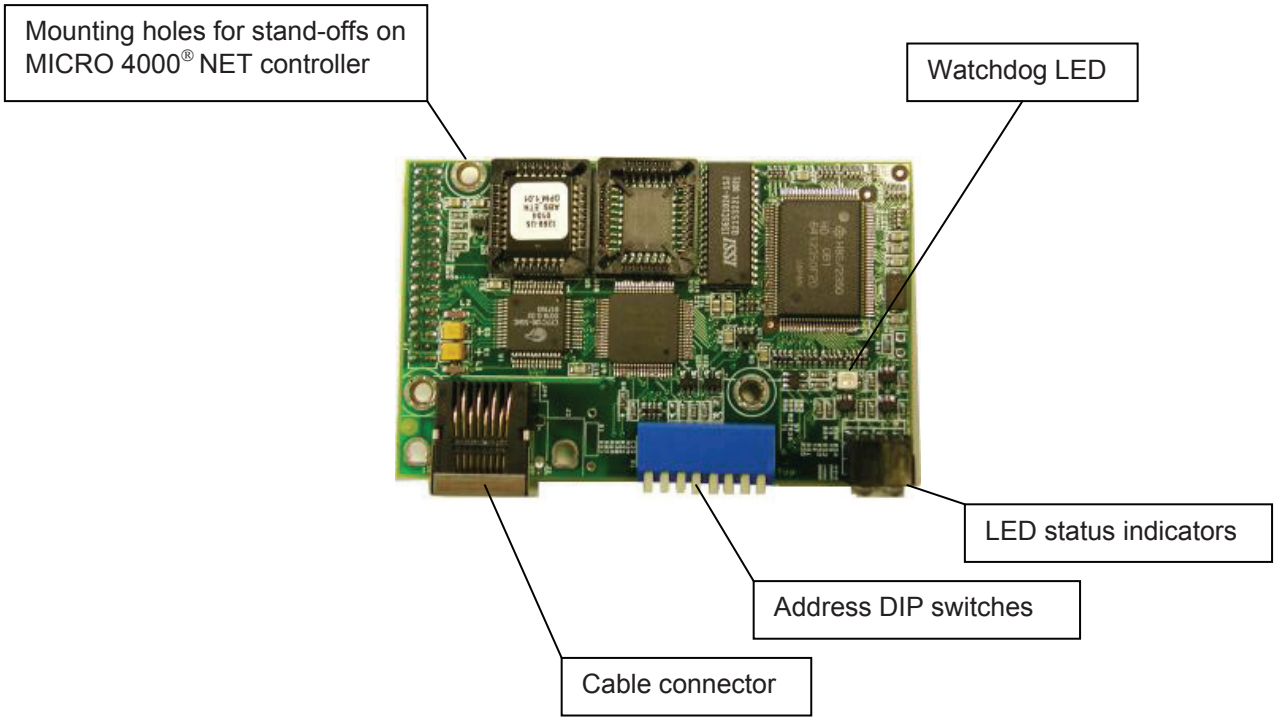
DWG. BY: DKR	SCALE: N.T.S.	DWG. NO:	REV:
CKD. BY:	DATE: 11–2–00	EB–9038	

Appendix 5 / Ethernet TCP/IP and Modbus/TCP Interface

Product Specifications:

- Card size (H x W x D): 3.38” [86mm] x 2.13” [54mm] x 0.59” [15mm]
- Power requirements: None – provided by network
- Operating environment:

Maximum ambient temperature	120 deg F [48.9 deg C]
Humidity	0-90% non-condensing



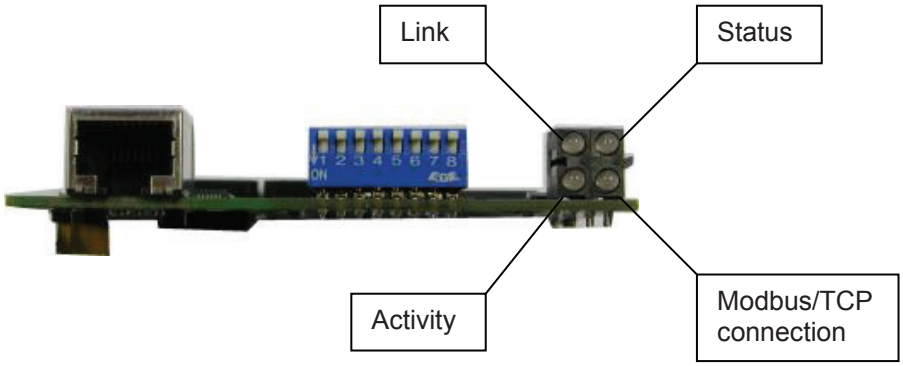
Ethernet is one of the most popular network technologies in use today. The major reasons for Ethernet’s popularity is a suitable mix of speed, cost and ease of installation. These benefits, the market acceptance, and possibility to support, more or less, any non-real-time critical protocol, makes Ethernet an ideal networking technology for most systems.

The media for Ethernet is a dual, twisted-pair, non-shielded copper wire. Industrial wiring well-shielded cables is highly recommended. A standard Ethernet installation uses a bit rate of 10 Mbit/sec.

A standard 10BASE-T network allows a maximum length of 100 meters. Since every cable is a separate segment, only two nodes per segment are possible. Repeaters, hubs, routers, and switches are used to connect the individual segments to larger networks.

Ethernet only specifies the lower layers in the network, so additional protocols like Ethernet TCP/IP together with Modbus/TCP is needed to form an environment that is easier to use. The Modbus protocol in the module conforms to the Modbus/TCP specification 1.0.

The module is equipped with four status LEDs mounted at the front of the card and one watchdog LED mounted in the middle of the card, used for debugging purposes. The function of the LEDs is described in the figure and tables below. The four status LEDs indicate network and module status.



Status LEDs	Description
Link – steady green	Module is connected to network
Status – green flash every 1 sec.	IP address is not set by value on the dip switches
Status – red flash every 1 sec.	MAC address is not correct. The module will not be able to initialize
Status – red flash every 2 sec.	Module failed to load configuration from the FLASH memory
Status – red flash every 4 sec.	Internal error
Modbus/TCP connection – flashes green to indicate number of connections.	Connection established
Activity – flashes green/off2	Packet received or transmitted

Watchdog LED	Color	Frequency
No firmware exists	Red	8Hz
Firmware downloading	Red/Green	1Hz
ROM check fault	Red	2Hz
Module not initialized	Green	2Hz
Module initialized and running OK	Green	1Hz
RAM check fault	Red	1Hz
DPRAM check fault	Red	4Hz

Ethernet TCP/IP and Modbus/TCP Addressing:

The read command (MICRO 4000 NET to Fieldbus Master (host)) must use register 40001.

The write command (Fieldbus Master (host) to MICRO 4000 NET) must use register 41025.

Setting the IP address:

If the module's DIP switch setting is set between 1 and 255 the default settings below will be used:

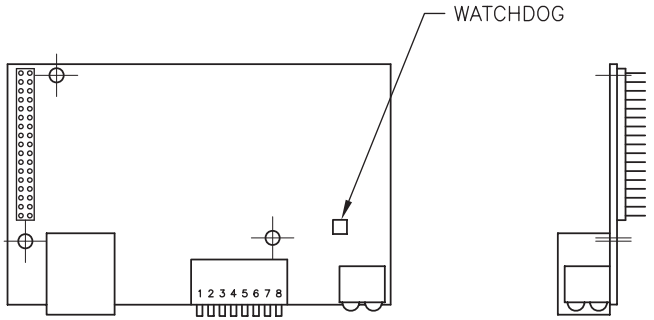
IP address:	192.168.0.X
Subnet mask:	255.255.255.0
Gateway address:	0.0.0.0

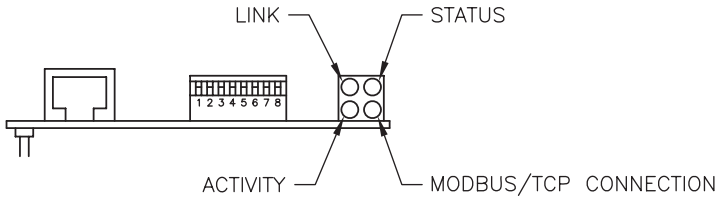
The last byte (X) in the IP address is set to the module's DIP switch setting. Switch 1 is the MSB, and switch 8 is the LSB. When a switch is in the "On" or "Closed" position, it is interpreted as a "1".

If the DIP switch setting is 0, then the IP address that is stored in the FLASH memory will be used.

If no settings are stored in the FLASH memory, then the module will not accept the END INITIALIZE process and the Status LED will flash Red at a 2Hz rate to indicate that the attempt to load from FLASH failed.

The settings can be stored in FLASH memory through a web page located in the module. To access this web page, set the IP address of your computer to the IP address above, use 254 for the last byte (X). Set the module's DIP switch to 1 (00000001). Using Internet Explorer, browse for the IP address above; use the module's DIP switch setting for the last byte (X). A web page will appear with information on changing the IP address of the card. After changing the IP address of the card, set the DIP switches to 0 and cycle power to the MICRO 4000 NET. The card's FLASH memory will now load the new IP address from FLASH memory.





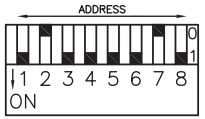
NOTES:

TERMINATING MODULE:
THE ETHERNET MODULE USES TWISTED–PAIR CABLES, AND DO NOT NEED AN EXTERNAL TERMINATOR.

NODE ADDRESS:
THE ETHERNET MAC ID IS PERMANENT AND CAN NOT BE CHANGED BY THE USER.
THE IP–ADDRESS IS CONFIGURED AT THE INITIALISATION OF THE MODULE.
IF THE DIP SWITCH VALUE IS SET BETWEEN 1–255 THE DEFAULT SETTING BELOW WILL BE USED

IP ADDRESS: 192.168.0.X
SUBNET MASK: 255.255.255.0
GATEWAY ADDRESS: 0.0.0.0

THE LAST BYTE (X) IN THE IP ADDRESS IS SET BETWEEN 1–255 WITH THE DIP SWITCH ON THE MODULE. SWITCH 1 IS THE MSB IN THE BYTE, AND SWITCH 8 IS THE LSB. WHEN A SWITCH IS IN THE "ON" OR "CLOSED" POSITION, IT IS INTERPRETED AS LOGIC "1".



ADDRESS	SET DIP 1–8
0	0 0 0 0 0 0 0 0
1	0 0 0 0 0 0 0 1
2	0 0 0 0 0 0 1 0
.	.
.	.
253	1 1 1 1 1 1 0 1
254	1 1 1 1 1 1 1 0
255	1 1 1 1 1 1 1 1

RJ45 ETHERNET CONNECTIONS		
PIN	SIGNAL	DESCRIPTION
1	TD+	POSITIVE TRANSMIT DATA
2	TD–	NEGATIVE TRANSMIT DATA
3	RD+	POSITIVE RECEIVE DATA
4	NC	NO CONNECTION
5	NC	NO CONNECTION
6	RD–	NEGATIVE RECEIVE DATA
7	NC	NO CONNECTION
8	NC	NO CONNECTION
CASTING	PE	PROTECTIVE EARTH

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
FIELD BUS INTERFACE
ETHERNET

DWG. BY: DR	SCALE: N.T.S.	DWG. NO:	REV:
CKD. BY:	DATE: 11–11–02	EB–9361	

Service / Return Authorization

Service:

For questions concerning your equipment or conditions not covered by the Troubleshooting sections in this manual, please contact AccuWeb for assistance:

AccuWeb, Inc.

P.O. Box 7816

Madison, WI 53707

Tel: (608) 223-0625

Fax: (608) 223-0074

Email: frontdesk@accuweb.com

Web site: www.accuweb.com

Shipping address:

AccuWeb, Inc.

4249 Argosy Ct.

Madison, WI 53714

Please have the system model number and serial number available prior to your call or include it in your correspondence.

Field service is available to assist in installation and/or troubleshooting. Contact AccuWeb for price and availability.

Important: Before returning equipment to AccuWeb please verify that all mechanical and electronic components are secured for shipping. If you are returning mechanical equipment, make sure all clamps and spreaders are re-installed. If you are returning electronic equipment, make sure all circuit boards are securely mounted in their enclosures. If you are returning individual circuit boards, enclose each board in an anti-static bag and cushion it with bubble-wrap.

International Returns: All items being returned from a foreign country must clearly state on the shipping paperwork that the goods were manufactured in the USA and are being returned for repair. Failure to do so will result in additional customer costs for import duties and other charges. These additional costs will be added to the customer invoice.

Return Authorization:

Parts being returned for repair must have a return authorization (RA) number issued before returning.

Please call for and request a return authorization so that your repair can be processed quickly.

Restocking Policy

The following is our restocking policy:

Restocking Charge:

The exchange or return of parts and/or equipment will be subject to inspection in seller's plant.

a) All returned parts will include a restocking charge. The only exception will be when the exchange is required because of mistakes by the seller.

b) New, unused parts returned within 30 days shall carry a 10% restocking charge.

c) New, unused parts returned within 6 months shall carry a 20% restocking charge.

d) New, unused parts returned after 6 months shall be reviewed individually by the Service Department in the seller's plant and shall carry a minimum 30% restocking charge. This is required because of the continued modification and redesign of standard components and parts.

e) Fabricated items such as positive displacement guides, steering rolls, rollers, etc. will be reviewed individually and will have a minimum 50% restocking charge. There may be cases where the seller will not be able to accept the return of the equipment for credit.

f) All returned control cables will have a minimum 50% restocking charge. There may be cases where the seller will not be able to accept the return of the cables for credit. The only exception will be when the exchange is required because of mistakes by the seller.

g) Buyer pays freight both ways. The only exception will be when the exchange is required because of mistakes by the seller.

Warranty Policy

Warranty:

Except as otherwise noted by any attachments hereto, AccuWeb, Inc. products are warranted to be free from defects in design, materials and workmanship for a period of one (1) year from date of delivery. On web guide systems installed by the buyer, AccuWeb, Inc. will replace or repair, at its option, any defective parts returned to AccuWeb, Inc., freight and customs duties prepaid, at no charge to the buyer.

The following items are excluded from this warranty:

1. Routine maintenance and adjustment, as specified in the equipment instruction manual.
2. Failure due to improper installation by the buyer or inadequate maintenance by the buyer.
3. Malfunctions that occur as a result of buyer-supplied interfacing.
4. Physical damage resulting from an accident, misuse or abnormal condition of operation.

NO other warranty is expressed or implied including warranties or merchantability and fitness for any particular purpose. We are not liable for incidental or consequential damage such as, but not limited to, lost profits, loss or use of other equipment, or increases in operating costs or expenses.

Receipt of Shipment:

All equipment is tested before shipment, and is shipped in good condition. Any damages or shortages evident when the equipment is received must be immediately reported to the commercial carrier who transported the equipment. If required, assistance is available from the nearest AccuWeb representative. Always refer to the AccuWeb order number, model number, and serial number when contacting AccuWeb, Inc.

Note: The information contained herein is accurate at the time of publication. AccuWeb, Inc. reserves the right to make design changes to equipment described in this manual at any time and without notice.

Installation Drawings

Refer to these drawings to make installation easier:

1. Application drawing # AC-6554

   This drawing shows the enclosure mounting hole pattern.

2. Connection diagram #EB-9857

   This drawing shows the connections inside the MICRO 4000 NET enclosure.

3. Connection diagram #EB-9849

   This drawing shows how to configure the PWM motor drive's power supply

4. Field wiring diagram for standard system configuration #EB-8545

   This drawing shows how to wire the controller to the user's system.

5. Application drawing # AB-8815

   This application drawing shows the Remote Station mounting hole pattern.

6. Connection diagram # EB-8415

   This drawing shows how to wire the Remote Station and Digital Line Guide to the controller.

7. Application drawing # AC-6844

   This application drawing shows the Digital Line Guide mounting hole pattern.

8. Application drawing for various PDG web paths #C-7634

   This drawing shows the different web path configurations that can be used with a positive displacement guide (PDG).

9. Application drawing for Intermediate Guiding #AC-7635

   This drawing shows how to install a positive displacement guide (PDG).

10. Application drawing for Intermediate Guiding #AC-7636

    This drawing shows how to install a single roll steering roll (SRSR).

11. Application drawing for Intermediate Guiding #AC-7637

    This drawing shows how to install a double roll steering roll (DRSR).

12. Application drawing for Winder/Rewind Guiding #AC-7638

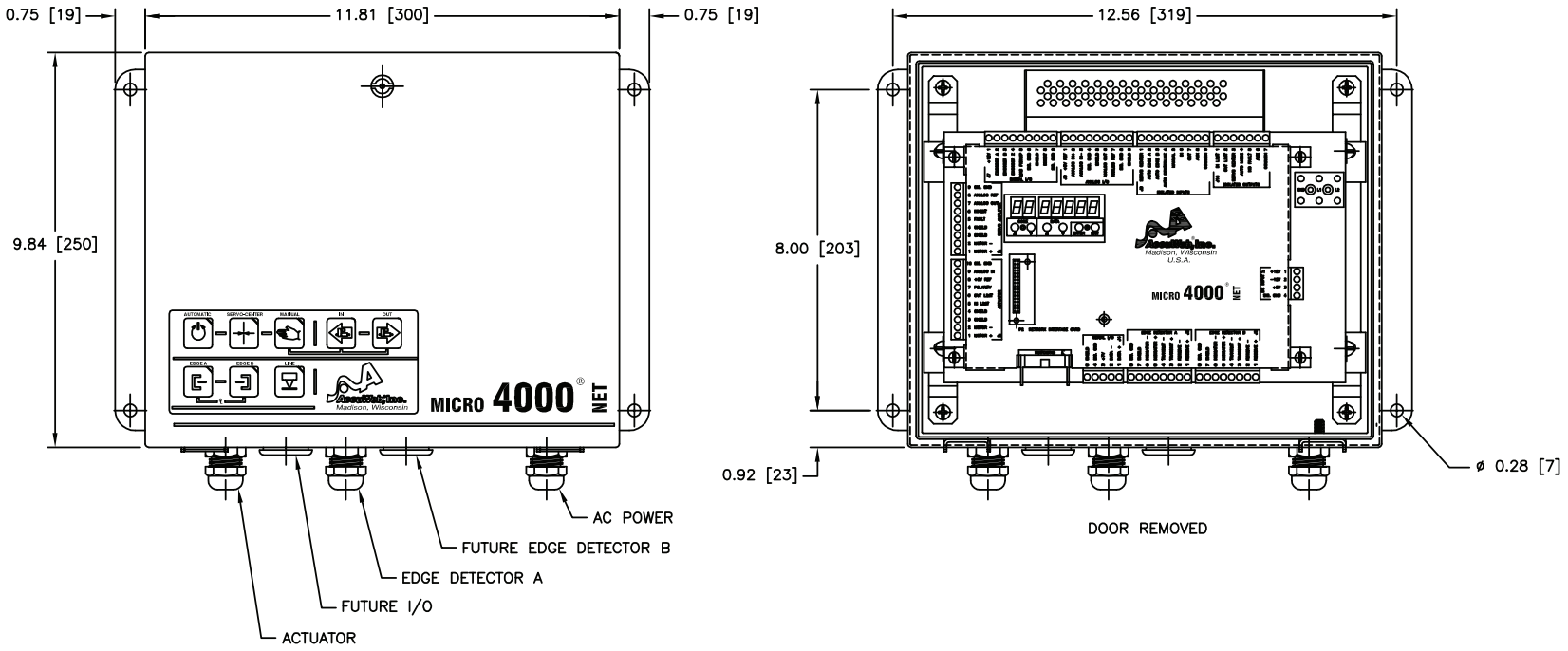
    This drawing shows how to install a shifting base for rewind guiding.

13. Application drawing for Unwind Guiding #AC-7639

    This drawing shows how to install a shifting base for unwind guiding.

14. Application drawing for Hi-Temp Edge Detector #AD-7147

    This drawing shows how to install a Hi-Temp edge detector.



FINISH: RAL 7035 ROUGH TEXTURED LIGHT GRAY.
OPTIONAL: TYPE 304 STAINLESS STEEL.
LATCH: 1/4 TURN TAMPER PROOF WITH KEY.
RATING: IP66

IN. [MM]

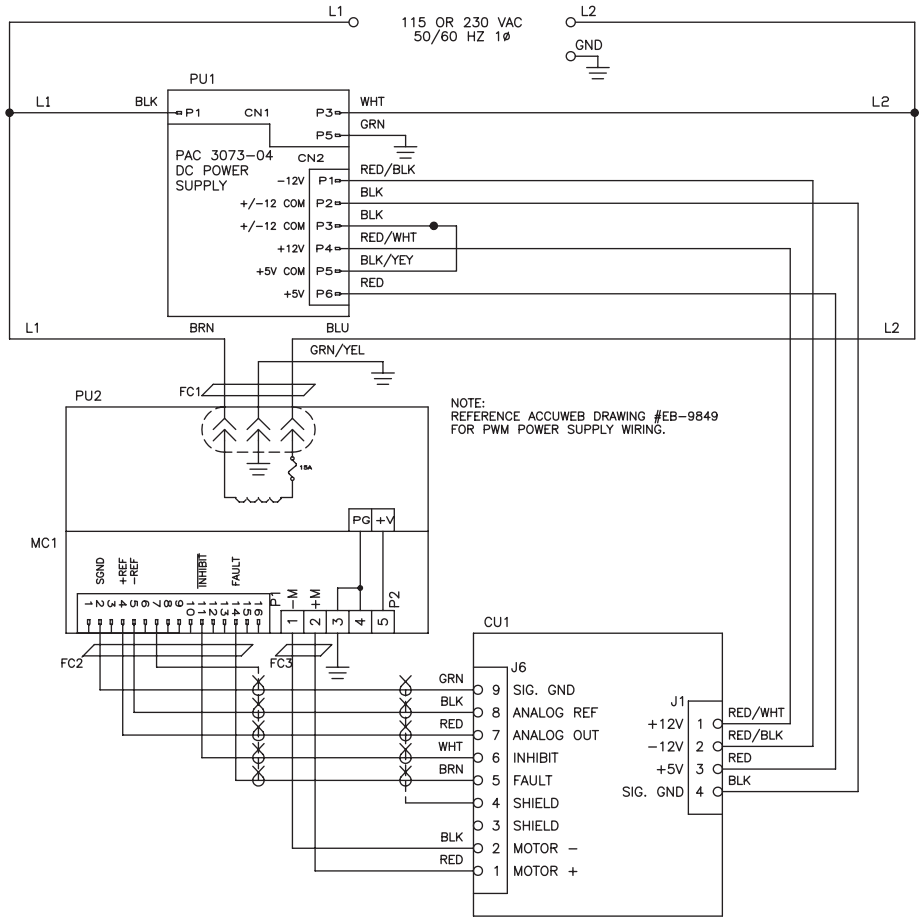
NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
C	REVISED POWER SUPPLY.	12-15-06	DR	1322
B	ADD STAINLESS OPTION	7-7-00	DR	
A	RELEASED	6-4-99	DR	

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
ENCLOSURE LAYOUT
MICRO 4000 NET

DWG. BY: DR	SCALE: 1/2 = 1	DWG. NO:	REV:
CKD. BY:	DATE: 1-22-99	AC-6554	C



ACTUATOR TYPE	SYSTEM PART NUMBER	POWER LINE VOLTAGE	DC MOTOR VOLTAGE	PWM POWER SUPPLY PU2	PWM SERVO AMPLIFIER MC1
MX	CTL 4140-01 PN:202064-01	115VAC	24VDC, 3A	PAC 3152-01 PN:000705-05	MCB 3084 PN:000701-01
	CTL 4240-01 PN:202065-01	230VAC		PAC 3152-02 PN:000705-06	
MME, MT	CTL 4100-01 PN:202064-01	115VAC	48VDC, 3A	PAC 3098 PN:000705-01	MCB 3084 PN:000701-01
	CTL 4200-01 PN:202065-01	230VAC		PAC 3098-1 PN:000705-03	
MNE, SF, MO HF HT 1/4 HP HT 1/3 HP	CTL 4110-01 PN:202064-02	115VAC	90VDC, 6A	PAC 3097 PN:000705-02	MCB 3083 PN:000701-02
	CTL 4210-01 PN:202065-02	230VAC		PAC 3097-1 PN:000705-04	
HL 1/2 HP HT 1/2 HP	CTL 4120-01 PN:202064-03	115VAC	90VDC, 7.5A	PAC 3097 PN:000705-02	MCB 3083-01 PN:000701-04
	CTL 4220-01 PN:202065-03	230VAC		PAC 3097-1 PN:000705-04	
UHT	CTL 4130-01 PN:202064-04	115VAC	90VDC, 10A	PAC 3097 PN:000705-02	MCB 3083-02 PN:000701-03
	CTL 4230-01 PN:202065-04	230VAC		PAC 3097-1 PN:000705-04	

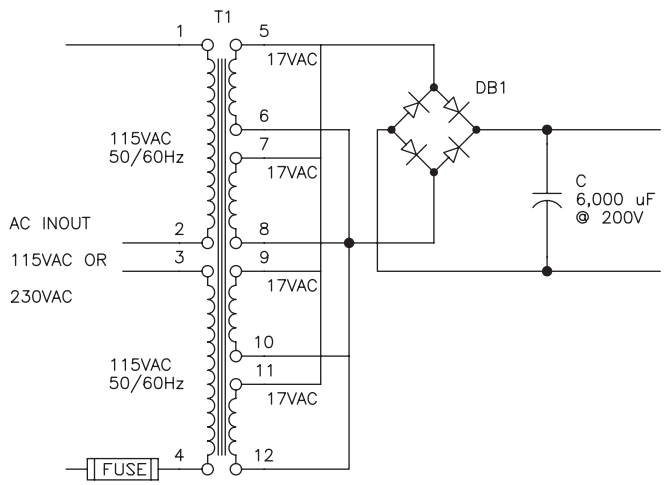
AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

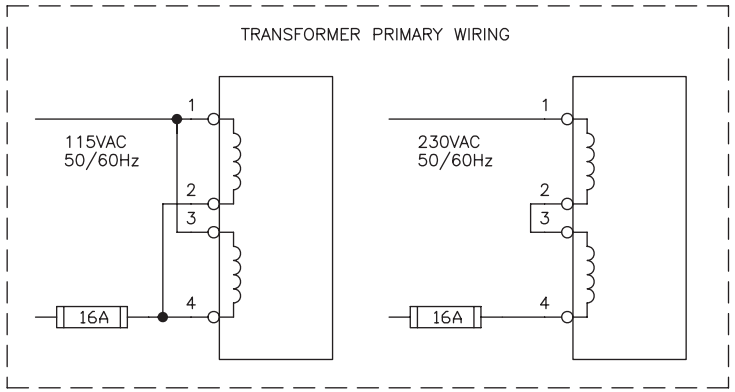
TITLE:
CONNECTION DIAGRAM
MICRO 4000 NET

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

DWG. BY: DR	SCALE: N.T.S.	DWG. NO: EB-9857	REV:
CKD. BY:	DATE: 12-15-06		

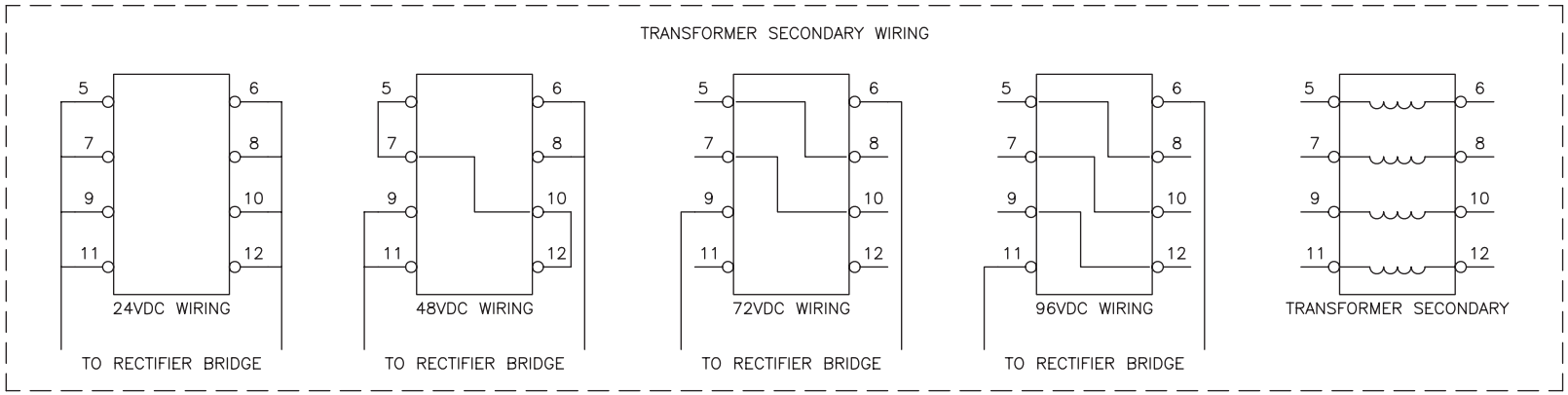
NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.





A

POWER LINE VOLTAGE	DC MOTOR VOLTAGE	PWM POWER SUPPLY PU2
115VAC	24VDC, 3A	PAC 3152-01 PN:000705-05
230VAC		PAC 3152-02 PN:000705-06
115VAC	48VDC, 3A	PAC 3098 PN:000705-01
230VAC		PAC 3098-1 PN:000705-03
115VAC	72VDC, 6A	PAC 3154-01 PN:000705-07
230VAC		PAC 3154-02 PN:000705-08
115VAC	90VDC, 6A	PAC 3097 PN:000705-02
230VAC		PAC 3097-1 PN:000705-04
115VAC	90VDC, 7.5A	PAC 3097 PN:000705-02
230VAC		PAC 3097-1 PN:000705-04
115VAC	90VDC, 10A	PAC 3097 PN:000705-02
230VAC		PAC 3097-1 PN:000705-04



AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

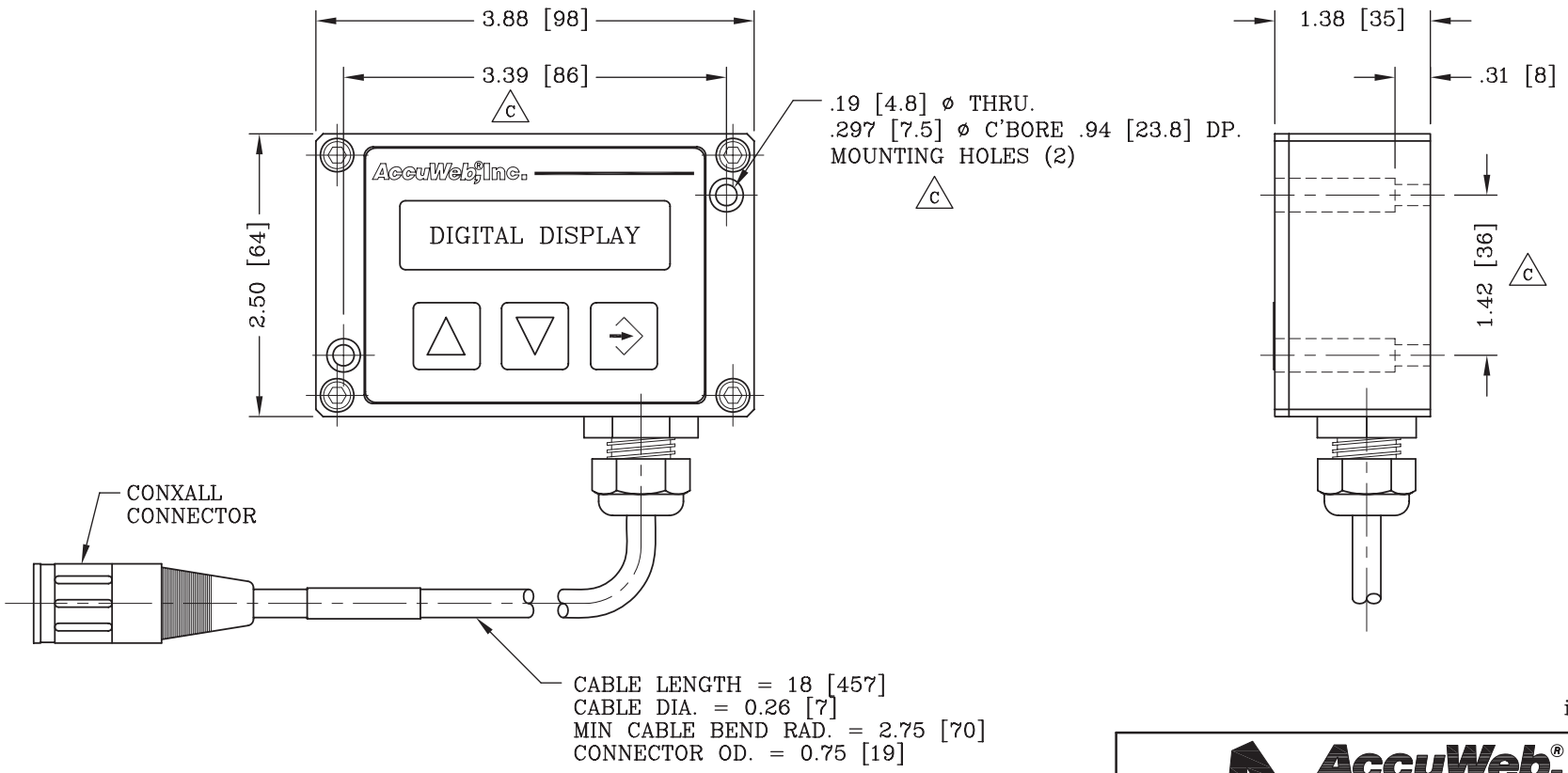
TITLE:
PWM POWER SUPPLY WIRING
MICRO 4000 NET

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
A	WAS PAC 3052-01, WAS PAC 3052-02.	8-27-07	DR	1326

DWG. BY: DR	SCALE: N.T.S.	DWG. NO:	REV:
CKD. BY:	DATE: 11-11-05	EB-9849	A

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
D	ADD NOTE.	3-18-13	DR	
C	ADD HL AND HL ACTUATOR. REMOVED MO ACTUATOR.	12-23-05	DR	
B	REVISED SWITCH PAD: WAS C/L, WAS EDGE B, ADDED NOTE.	11-1-01	RJO	1219
A	REVISED MX CONNECTION INFORMATION.	2-2-01	DR	



in. [mm.]

NOTE:
This drawing & information contained therein are the proprietary property of AccuWeb, Inc.

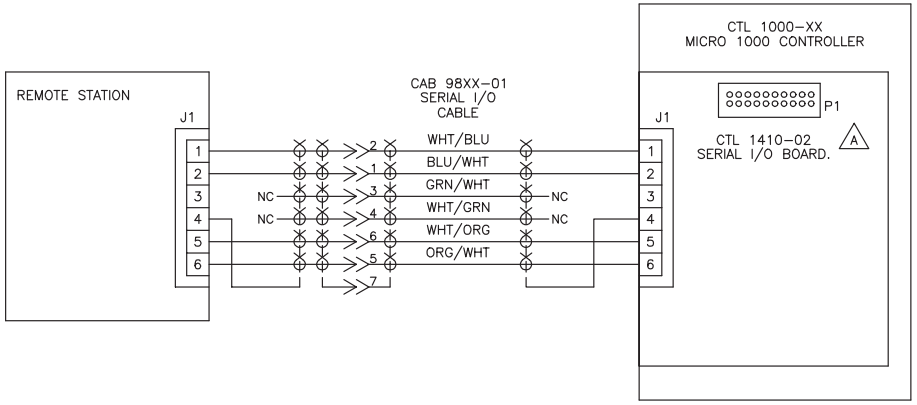
REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
C	ADDED HOLES IN COVER, DIMS WERE 1.50 & 3.50	6-1-10	MSB	1343
B	REPLACED CASTED ENCLOSURE WITH MACHINED ENCLOSURE.	2-25-10	DR	13348
A	WAS 2.15, WAS 3.15, WAS 1.26, MOVED COVER SCREWS, MOVED MTG. HOLE LOCATION.	3-19-03	DR	

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

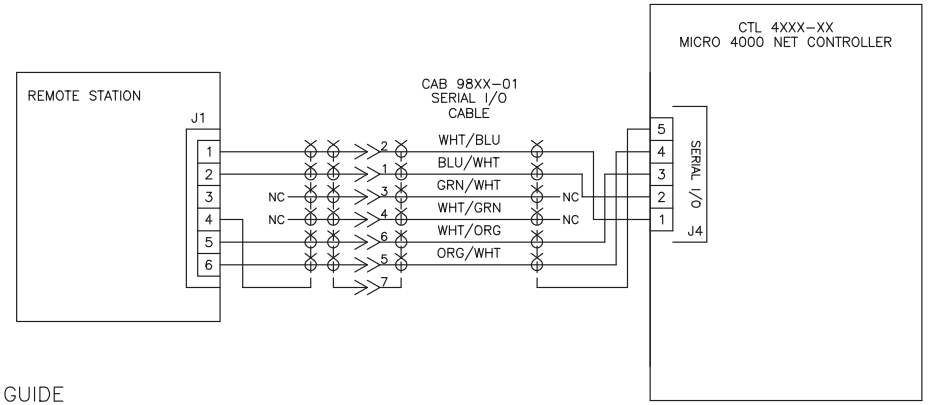
TITLE:
THREE BUTTON REMOTE STATION, APPLICATION

DWG. BY: DR	SCALE: FULL	DWG. NO: AB-8815	REV: C
CKD. BY:	DATE: 4-5-00		

MICRO 1000 CONNECTION



MICRO 4000 NET CONNECTION



NOTE:
REMOTE STATIONS INCLUDE:
P/E 5000-02 DIGITAL LINE GUIDE
RGPA 1000-01 2 BUTTON REMOTE GUIDE POINT ADJUST STATION
RMT 1003-01 3 BUTTON REMOTE STATION.

CABLE LENGTHS AVAILABLE:
6' [1.8M]
12' [3.6M]
25' [7.6M]
50' [15.2M]
75' [22.8M]
100' [30.4M]

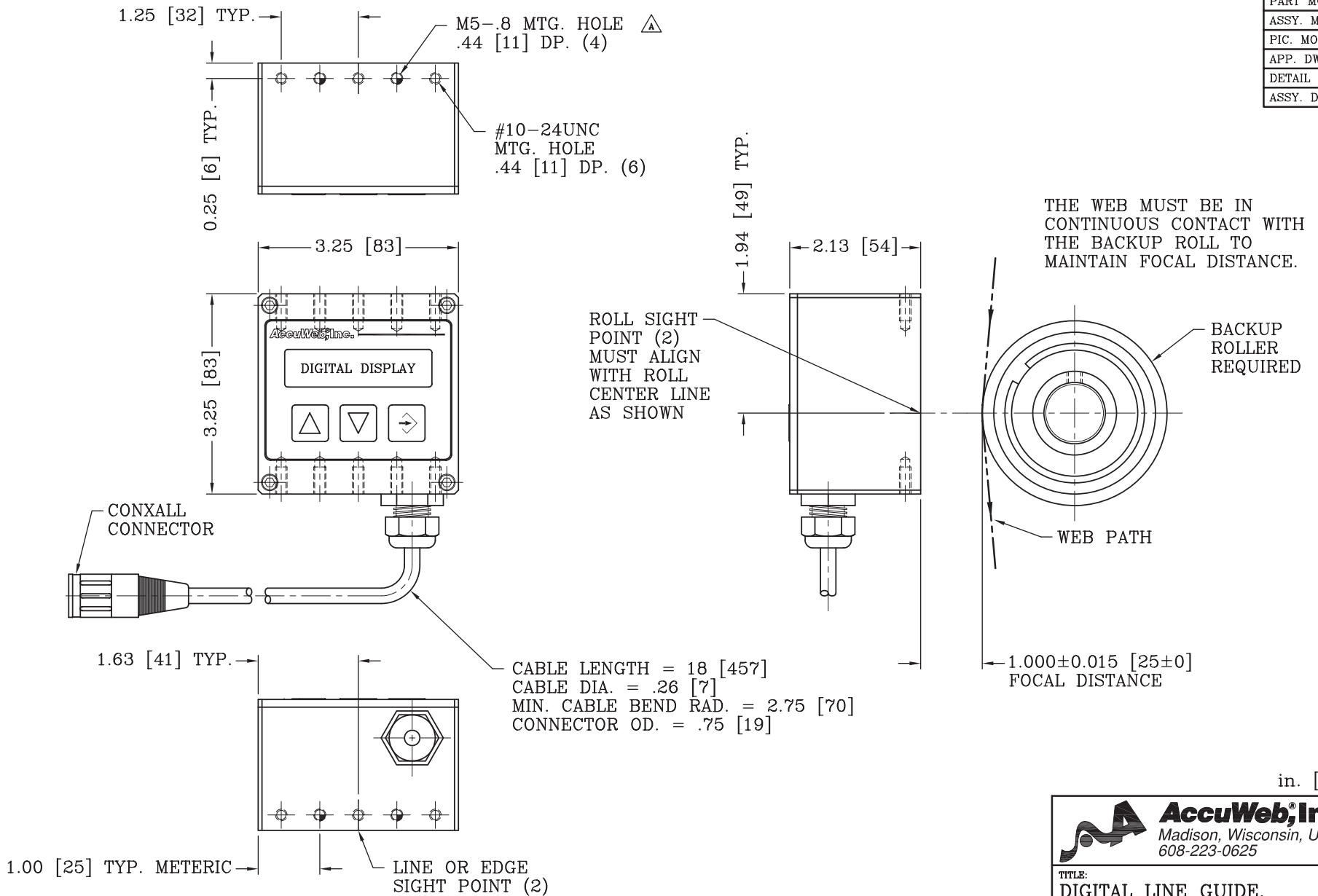
NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
A	WAS CTL 1410-01, TITLE WAS MICRO 1000 ADD MICRO 4000 NET CONNECTION.	4-6-00	DR	

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
CONNECTION DIAGRAM
SERIAL I/O

DWG. BY: DR	SCALE: N.T.S.	DWG. NO:	REV:
CKD. BY:	DATE: 2-10-99	EB-8415	A



S. W.	
PART MODEL	☐
ASSY. MODEL	☐
PIC. MODEL	☒
APP. DWG.	☐
DETAIL DWG.	☐
ASSY. DWG.	☐

in. [mm.]

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
DIGITAL LINE GUIDE, APPLICATION

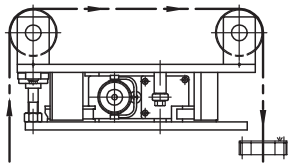
REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.
A	TITLE WAS P/E 5000-02, ADD METRIC MTG. HOLES.	10-30-07	DR	1329

DWG. BY: WJR	SCALE: FULL	DWG. NO:	REV:
CKD. BY:	DATE: 9-27-99	AC–6844	A

NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

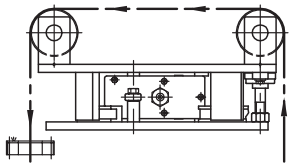
1

OVER WRAP
LEFT TO RIGHT



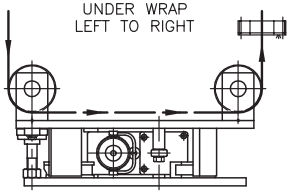
2

OVER WRAP
RIGHT TO LEFT



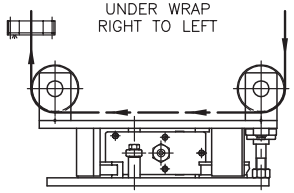
3

UNDER WRAP
LEFT TO RIGHT



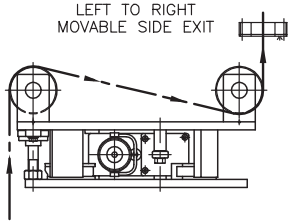
4

UNDER WRAP
RIGHT TO LEFT



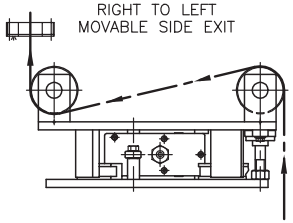
5

"Z" WRAP
LEFT TO RIGHT
MOVABLE SIDE EXIT



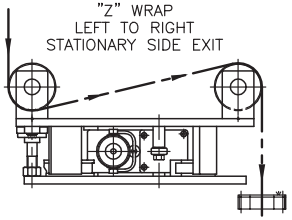
6

"Z" WRAP
RIGHT TO LEFT
MOVABLE SIDE EXIT



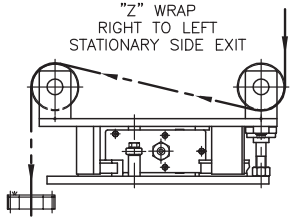
7

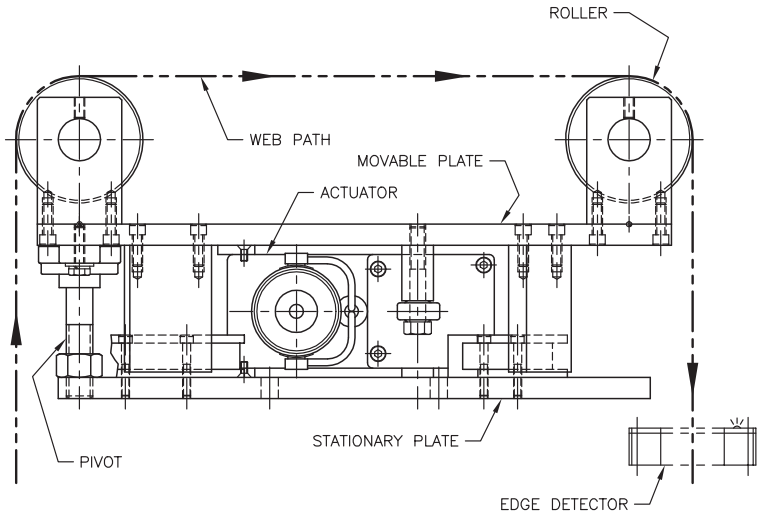
"Z" WRAP
LEFT TO RIGHT
STATIONARY SIDE EXIT



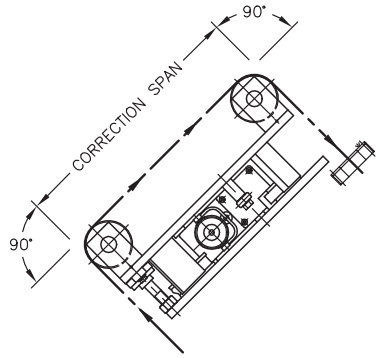
8

"Z" WRAP
RIGHT TO LEFT
STATIONARY SIDE EXIT





COMMON POSITIVE DISPLACEMENT GUIDE NOMENCLATURE



NOTE:
ALL POSITIVE DISPLACEMENT GUIDES CAN BE TURNED AND MOUNTED AT ANY ANGLE AS LONG AS THE WEB ENTERS AND EXITS THE GUIDE PERPENDICULARLY.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

BREAK ALL SHARP EDGES

DO NOT SCALE DWG.

UNLESS OTHERWISE SPECIFIED
0.00 +/−0.015
0.000 +/−0.005
0.0000+/−0.001
ANGLES +/−.5°

MAT'L:

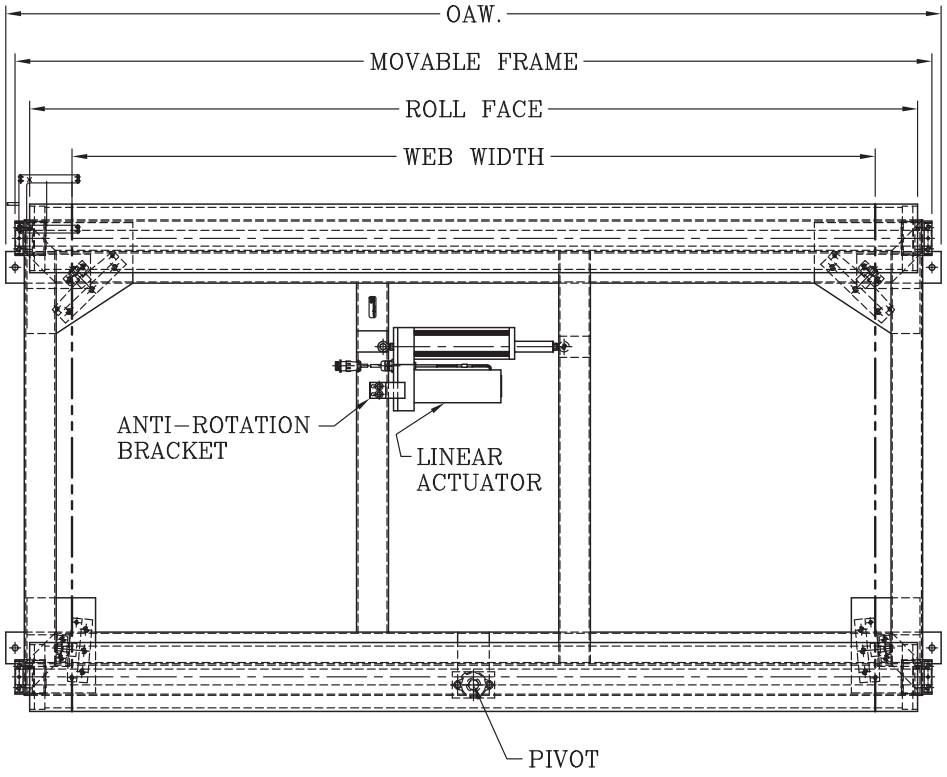
FINISH:

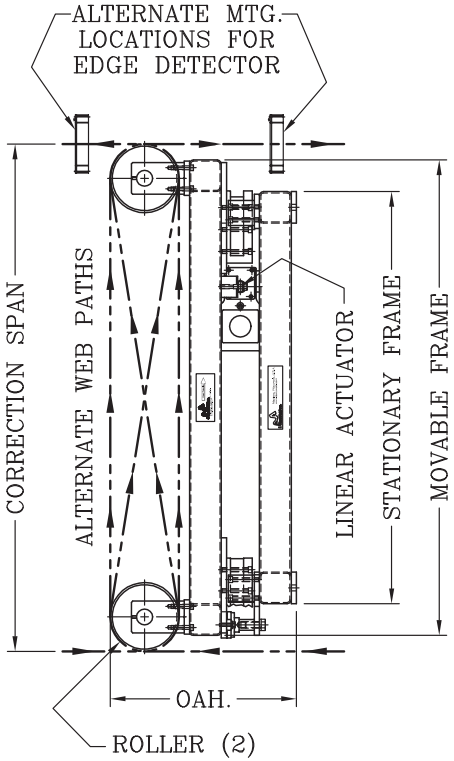
NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
POSITIVE DISPLACEMENT GUIDE
WEB PATH CONFIGURATIONS

DWG. BY: DJB	SCALE: 1 = 2	DWG. NO: C−7634	REV:
CKD. BY:	DATE: 5−24−01		





NOTE:
THE PROPER LOCATION FOR THE LINEAR ACTUATOR IS BETWEEN THE FRAMES AND NEAR THE EXITING ROLLER AS SHOWN.
BOLT THE LINEAR ACTUATOR TO THE FRAMES WITH GRADE #5 OR GRADE #8 FASTENERS.
ADJUST THE ANTI–ROTATION BRACKET TO ALLOW 1/32 TO 1/16 ACTUATOR MOVEMENT.
CONTACT ACCUWEB FOR RECOMMENDED LEAD–IN AND LEAD–OUT DIMENSIONS.

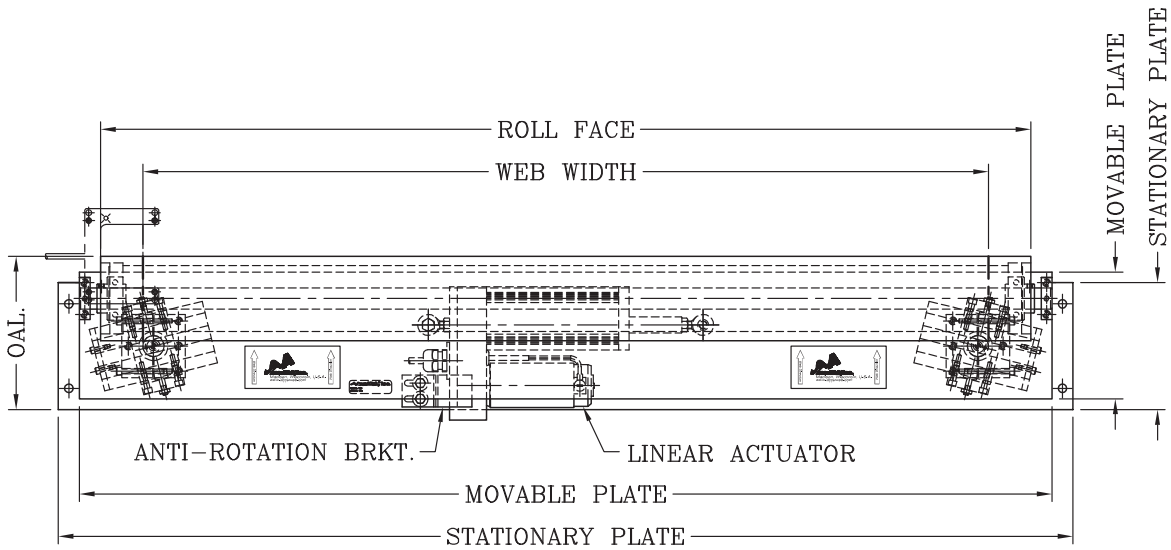
NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

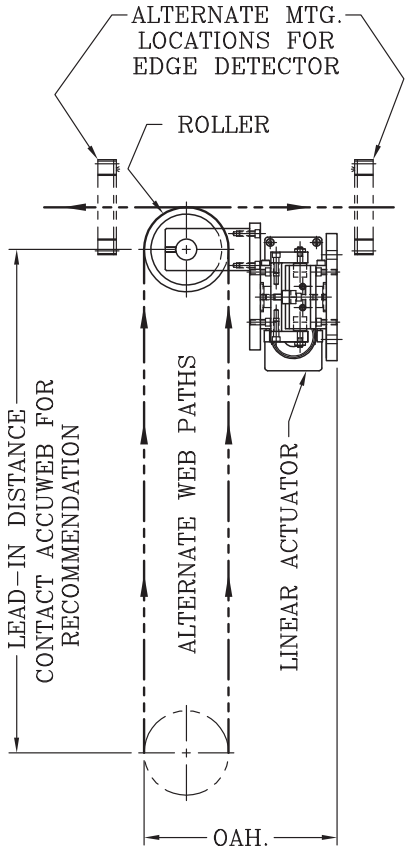
REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
CONFIGURATION FOR POSITIVE DISPLACEMENT GUIDE

DWG. BY: DJB	SCALE: 1 = 8	DWG. NO:	REV:
CKD. BY:	DATE: 5–24–01	AC–7635	





NOTE:
THE PROPER LOCATION FOR THE LINEAR ACTUATOR IS BETWEEN THE PLATES AND UNDER THE LOAD AS SHOWN.
BOLT THE LINEAR ACTUATOR TO THE PLATES WITH GRADE #5 OR GRADE #8 FASTENERS.
ADJUST THE ANTI-ROTATION BRACKET TO ALLOW 1/32 TO 1/16 ACTUATOR MOVEMENT.

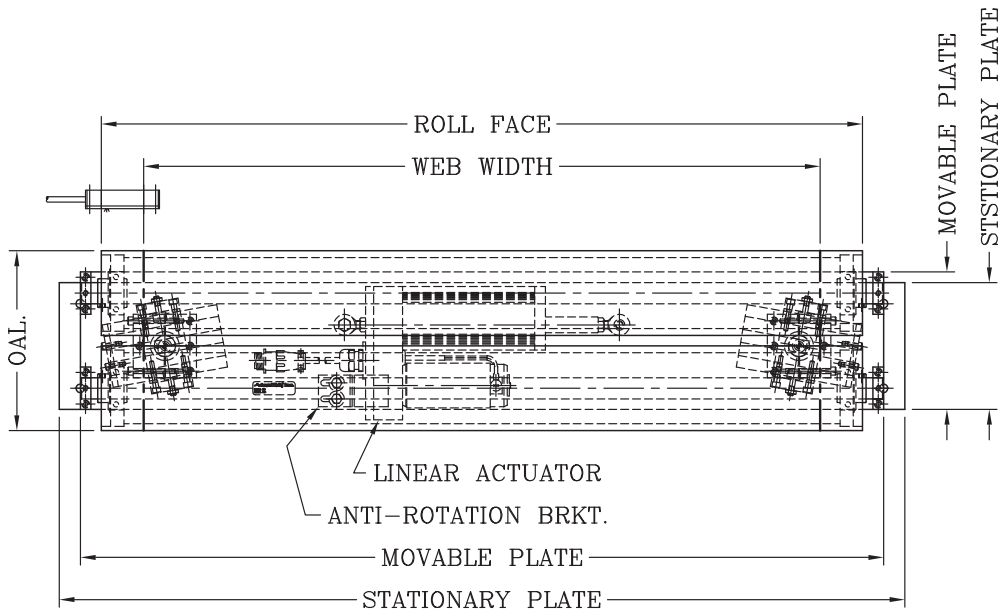
NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

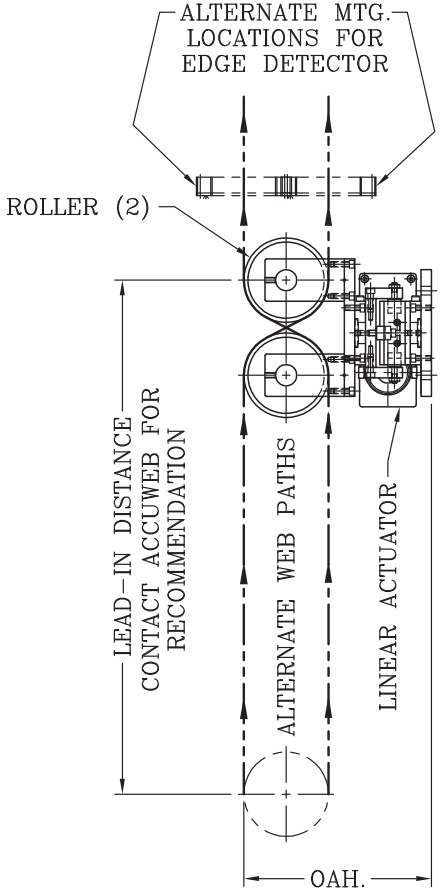
REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
CONFIGURATION FOR
SINGLE ROLL STEERING ROLL

DWG. BY: DJB	SCALE: 1 = 4	DWG. NO:	REV:
CKD. BY:	DATE: 5-23-01	AC-7636	





NOTE:
THE PROPER LOCATION FOR THE LINEAR ACTUATOR IS BETWEEN THE PLATES AND UNDER THE LOAD AS SHOWN.
BOLT THE LINEAR ACTUATOR TO THE PLATES WITH GRADE #5 OR GRADE #8 FASTENERS.
ADJUST THE ANTI–ROTATION BRACKET TO ALLOW 1/32 TO 1/16 ACTUATOR MOVEMENT.

in. [mm.]

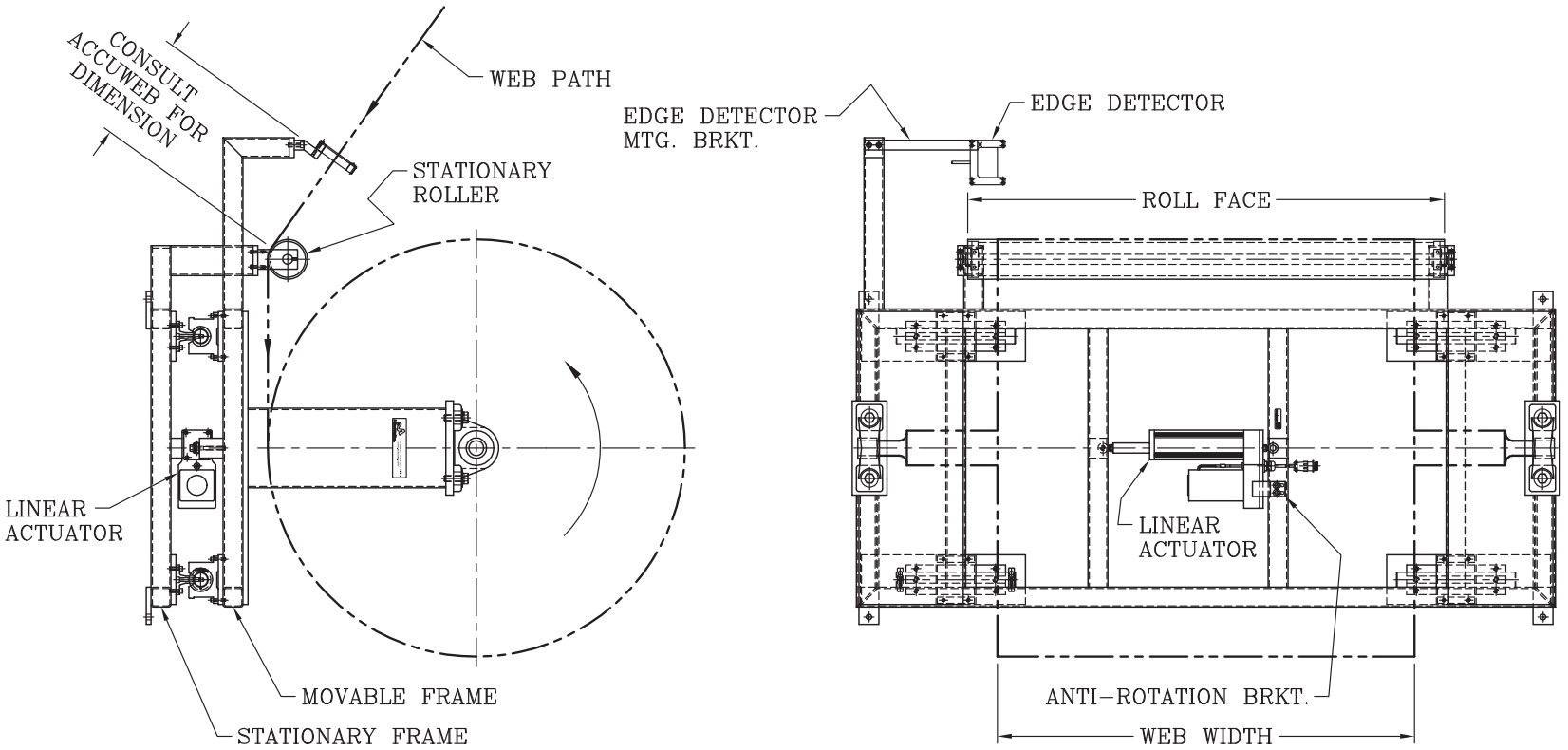
NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
CONFIGURATION FOR
DOUBLE ROLL STEERING ROLL

DWG. BY: DJB	SCALE: 1 = 4	DWG. NO:	REV:
CKD. BY:	DATE: 05–24–01	AC–7637	



NOTE:
THE PROPER LOCATION FOR THE LINEAR ACTUATOR IS BETWEEN THE FRAMES AND UNDER THE LOAD AS SHOWN.
BOLT THE LINEAR ACTUATOR TO THE FRAMES WITH GRADE #5 OR GRADE #8 FASTENERS.
ADJUST THE ANTI-ROTATION BRACKET TO ALLOW 1/32 TO 1/16 ACTUATOR MOVEMENT.
THE EDGE DETECTOR MUST BE MOUNTED TO THE MOVABLE FRAME.
THE STATIONARY ROLLER MUST BE MOUNTED BETWEEN THE EDGE DETECTOR AND THE STAND.

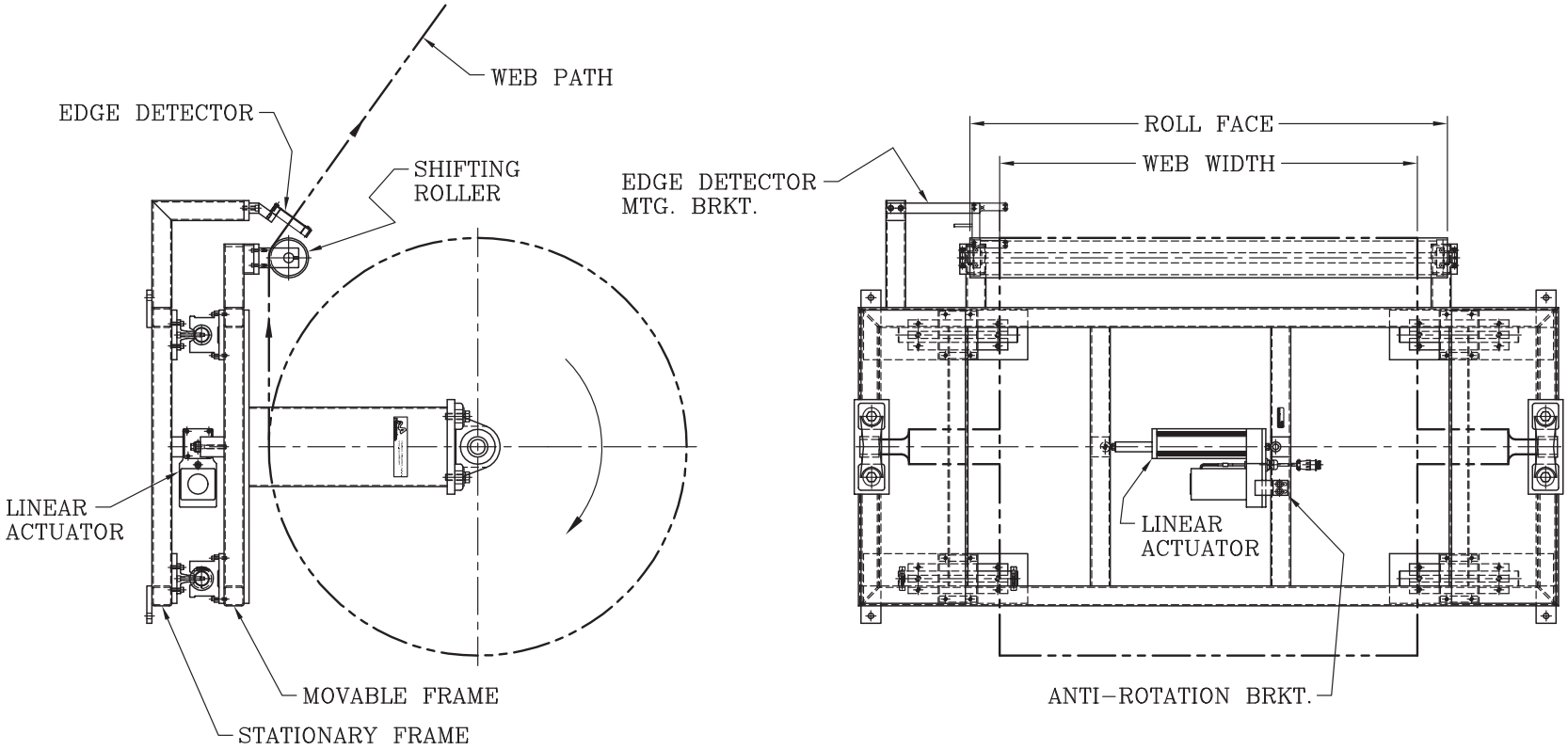
NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
REWIND CONFIGURATION FOR SHIFTING BASE

DWG. BY: DJB	SCALE: 1 = 8	DWG. NO:	REV:
CKD. BY:	DATE: 5-25-01	AC-7638	



NOTE:
THE PROPER LOCATION FOR THE LINEAR ACTUATOR IS BETWEEN THE FRAMES AND UNDER THE LOAD AS SHOWN.
BOLT THE LINEAR ACTUATOR TO THE FRAMES WITH GRADE #5 OR GRADE #8 FASTENERS.
ADJUST THE ANTI-ROTATION BRACKET TO ALLOW 1/32 TO 1/16 ACTUATOR MOVEMENT.
THE SHIFTING ROLLER MUST BE MOUNTED TO THE MOVABLE FRAME.
THE EDGE DETECTOR MUST BE STATIONARY AND LOCATED IMMEDIATLEY AFTER THE SHIFTING ROLLER.

NOTE:
This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

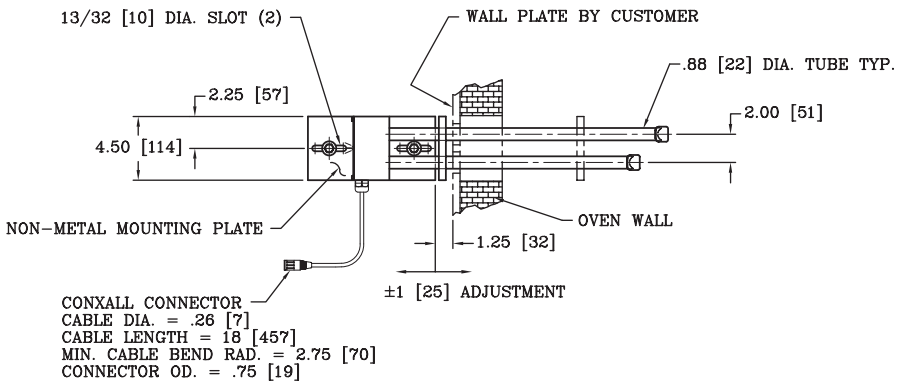
REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

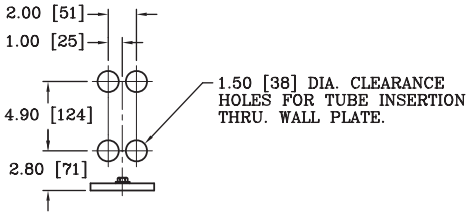
AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
UNWIND CONFIGURATION FOR SHIFTING BASE

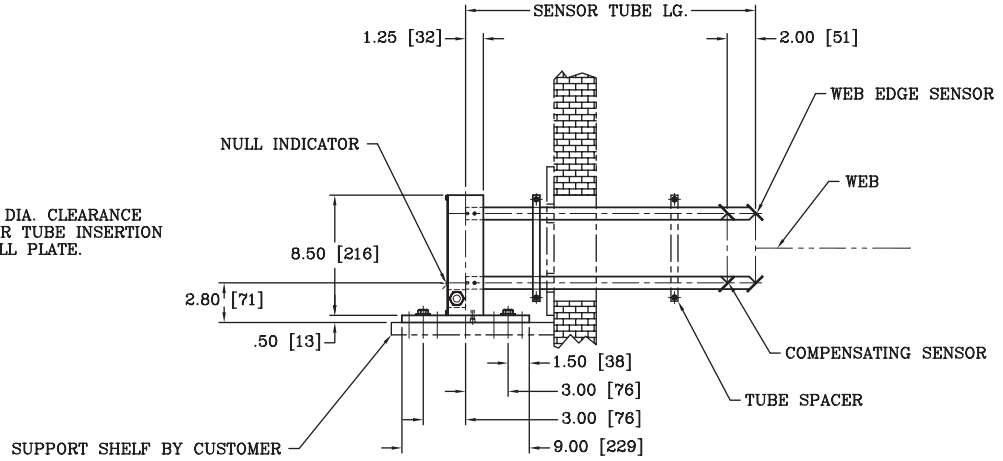
DWG. BY: DJB	SCALE: 1 = 8	DWG. NO:	REV:
CKD. BY:	DATE: 5-25-01	AC-7639	

MODEL NO.	SENSOR TUBE LG.	TUBE SPACER PLATE QTY.
UT 4068-25	25" [635]	1
UT 4068-84	84" [2134]	2





OVEN WALL HOLE PATTERN



in. [mm.]

NOTE:
EDGE DETECTOR ASSEMBLY MUST BE ELECTRICALLY INSULATED FROM CUSTOMERS EQUIPMENT.
SST. FASTENERS

NOTE: This drawing and information contained therein are the proprietary property of AccuWeb, Inc.

REV. NO.	DESCRIPTION	DATE	REV. BY	ECN NO.

AccuWeb, Inc.
Madison, Wisconsin, U.S.A.
608-223-0625

TITLE:
HIGH TEMP. E/D UT 4068-XX
BASE MOUNT, APPLICATION

DWG. BY. BRC	SCALE: 1/4 = 1	DWG. NO.	REV.
CKD BY.	DATE: 7-14-04	AD-7147	

NOTES

NOTES